amateur radio

Vol. 39, No. 5
MAY, 1971
Registered at G.P.O. Melbourne, for transmission by post as a periodical
Price: 35 Cents

AMERICAN RECORDING TAPE

(New, in sealed boxes)

1500 feet, 7-inch, Acetate, 1½ mil. $3.50
1200 feet, 7-inch, Acetate, 1½ mil. $2.50
1200 feet, 7-inch, Mylar, 1½ mil. $3.00
1200 feet, 5¾-inch, Acetate, 1 mil. $2.20
1200 feet, 5¾-inch, Mylar, 1 mil. $2.50

Postage 10c.

CASSETTE TAPES

Type C120 ... ... $1.50
Type C90 ... ... $1.20

New. Postage 10c.

NEW HEADPHONES AND MIKE

Phones 8 ohms, Mike 25 ohms
Price $15.75

METERS

MR2P METERS: square, face size 1¾-in., M/Hole 1½-in., res. 99 ohms. 0-1, 0-25, 0-250, and 0-500 mA. **Price $5.00** nett.

MR2P METERS: 0-5, 0-15, 0-30, 30-30 Amps. (Res. SOM/V). **Price $6.50** nett.

MR2P METERS: 0-15 volt DC, 0-30 volt DC. **Price $3.50.**

MR2P METERS: 0-50, 0-100, 100-100, 0-500 uA. (Res. 900 ohms). **Price $6.75.**

MO65 METERS: New. Face size 3½-in., M/H 2¾-in. Res. 120 ohms. 0-1, 0-5, 0-10, 0-20, 0-50, 0-100, 0-500 mA. **Price $5.25** nett. Post. 20c.

MO65 METERS RES.: 0-15, 0-30, 0-300 volt DC. **Price $5.40** nett. Postage 20c.

SWR 109 METER: Replacement. **Price $9.50.** Postage 20c.

P25 "S" METER: Price $6.50 nett.

P25 METERS: New. Face size 2½-in., M/H 2¾-in. Res. 60 ohms. 0-1, 0-5, 0-50, 0-100, 0-500 mA. **Price $6.00** nett. Postage 20c.

MR3P METERS: New. Face size 3½-in., M/H 2¾-in. Res. 120 ohms. 0-1, 0-10, 0-50, 0-100, 0-500 mA. **Price $6.75** nett. Postage 20c.

MR3P METERS: 0-50, 50-50, 0-100, 0-500 uA. **Price $9.20** nett. Postage 20c.

MASTER METERS: New. Model S21. Size 2½-in., M/H 2-in. C/R 50-50 uA. Plain face. **Price $4.00** nett. Postage 20c.

MASTER METERS: New. Model S212 24F/498. Face size 3½-in., M/H 2¾-in. C/R 1-1 mA. Plain face. **Price $3.70** nett. Postage 20c.

MASTER METERS: New. Model 212 24F/502. 0-10 volt AC. Face size 3½-in., M/H 2¾-in. **Price $4.50** nett. Postage 20c.

GREEN CAP CONDENSERS

Sizes: 0.001, 0.0022, 0.0033, 0.0047, 0.0056, 0.0068, 0.0082 uF. **Price 12c each.**

Sizes: 0.01, 0.022, 0.033, 0.039, 0.047, 0.056, 0.082 uF. **Price 15c each.**

Sizes: 0.1, 0.22, 0.33, 0.39, 0.47 uF. **Price 18c each.**

1 uF. (200v.w.), 2 uF. (200v.w.). **Price 58c each.**

BARGAIN ITEMS

Mini push-button Switches, new, 45c each.
Belling-Lee Sockets, 40c each.
Belling-Lee Plugs, 45c each.
Belling-Lee Line Joiners 48c each.
Spring-loaded Terminal Posts, yellow, green, red or black, 15c each.
3.5 mm. Plugs, 25c each.
2.5 mm. Plugs, 15c each.
6.6 mm. Plugs, 40c each.
Stereo Plugs, 60c each; Stereo Sockets, 50c each.
R.C.A. Plugs, 50c each.
4-pin Speaker Plugs, 22c pair.
3-pin Din. Plugs, 58c each.
SO239 Sockets, 95c each.
PL259 Plugs, $1.00 each.
Ladel Crystal Mike, $1.20 each.
TV Plug/Socket, 45c pair.
Jabel Crystal Sets Coil, new, 95c each.
Jabel Aligning Tool Kits, set of two, 85c.
Jabel Aligning Tool Kits, set of 4, $1.30.
Adel Nibbling Tools, $7.50 each.
Car Radio Speaker Control and volume front and rear, $3.00 each.
Neon Screwdriver, 240 volt, 55c each.
10 pairs S/A Clips, $1.60.
Ditto with 6-inch lead (ideal jumper leads), $1.60.
3.5-3.5 3-ft. leads, $1.20.
Jabel Rotary Switches, $1.20. 1 pole, 12 positions, 2-4, 2-5, 2-6, 3-3, 4-2.
501 Eddystone Variable Condensers, 50 pF. (no shaft), $1.50.

DISC CERAMIC CONDENSERS

25 volt working

Sizes: 0.1, 0.22, 0.27, 0.33, 0.01, 0.022, 0.0047, 0.033, 0.047 uF. **Price 18c each.**

Size: 0.47 uF. **Price 44c each.**

BROADCAST BAND TUNER

Locally made, Model 401 uses a shielded 3-stage I.F. Module with a single transistor mixer-osc. An AGC voltage is developed and applied to the 1st I.F. stage. High sensitivity is obtained with a ferrite rod, 8-in. long, 3/8-in. diam. Sensitivity: 150 uV.; bandwidth: 8 KHz.; supply voltage: 9V.; supply current: 5 mA.; audio output voltage: 0.5-1.0V.; load impedence: not less than 47K. Complete in plastic box with dial. Ready to plug in. **Price $25.00** nett.

POCKET CRYSTAL RADIO

Type ER22. Set complete. **Price $1.50.**

A.C. ADAPTOR—BATTERY SAVER

Type PS64—240 volts to 6 or 9 volts, 300 mA. **$12.50**
Type PS62—240 volts to 6 or 9 volts, 100 mA. **$8.50**

Postage 30c

C60 CASSETTE TAPES

Price 80c each

EXTENSION SPEAKERS

Type T530 Tubular Extension Speakers, 8 ohms, new. Complete with lead and two plugs 2.5 and 3.5 mm. **Price $4.30.** Postage 20c.

TELEPHONE INTER-COM. SETS

Telephone Inter-communication Set with signal bulb, two U2 batteries. Ideal for children. **Price $6.75.** Postage 30c.

EGG INSULATORS

For your Aerial. **8c each.**

VARIABLE CONDENSERS

Single gang. 10-415 pF. **Price $2.20.**

RESISTORS

½ watt **6c each**, 1 watt **10c each.**

VERNIER DIALS

Ratio 8 to 1 reduction, scale 0-10.

Type T 501 1½ inch diameter $2.00
Type T 502 2 inch diameter $2.75
Type T 503 3 inch diameter $3.30

LOW PASS FILTERS

A "Cabana" Low Pass Filter will fix T.V.I. Cut-off frequency, 30 MHz.; attenuation at 60 MHz. better than 30 dB.; insertion loss, negligible. Impedance 50-72 ohms.

Price $11.50. Postage 10c.

SOLID STATE STEREO AMPLIFIER

8 watts r.m.s. per channel. Input for magnetic, crystal and ceramic type microphone. P.V. cartridges, tape recorder input and output, tuner input, stereo headphone jack.

Reduced to $55.00. Postage $1.20.

FIVE-CORE CABLE

5 x 5/0076. Ideal for Intercoms., Telephones, etc. New. **100 yd. rolls, $17** (postage 75c), or **20c yd.**

STEREO HEADPHONES

Professional quality (well known brand). Large earpads, standard stereo plug, 8 ft. lead.

Price $5.75. Postage 50c.

CRYSTAL CALIBRATOR No. 10

Nominal range: 500 KHz. to 30 MHz. 500 KHz. xtal and 250 KHz./500 KHz. BFO. Provides heterodyne output in steps of 1 MHz. Dial driven by machine cut strip gears, calibrated in 2 KHz. div. Easily read to 250 cycles. Output "spiked" approx. 1 sec. intervals, identifies beat note. Power requirements: 12v. DC at 0.3 amp., 250 volts at 15 mA. This is a precision instrument. Complete with crystal.

Price $23.50

HAM RADIO SUPPLIERS

323 ELIZABETH STREET, MELBOURNE, VIC., 3000

Phones: 67-7329, 67-4286 All Mail to be addressed to above address

Our Disposals Store at 104 HIGHETT ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 10.30 a.m. to 5.0 p.m., and on Saturdays to midday.

We sell and recommend Leader Test Equipment, Pioneer Stereo Equipment and Speakers, Hitachi Radio Valves and Transistor Radios, Kew Brand Meters, A. & R. Transformers and Transistor Power Supplies, Ducon Condensers, Welwyn Resistors, etc.

amateur radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA. FOUNDED 1910

MAY, 1971
Vol. 39, No. 5

Publishers:
VICTORIAN DIVISION W.I.A.
Reg. Office: 478 Victoria Parade, East Melbourne, Vic., 3002.

Editor:
K. E. PINCOTT VK3AFJ

Publications Committee:
R. Dorin VK3ZU
Ken Gillespie VK3GK
Harold Hepburn (Secretary) VK3AFO
Peter Ramsay VK3ZWN
W. E. J. Roper VK3ARZ

Circulation—
Jack Kelly VK3AFD

Draughtsmen:—
Glen Allan VK3ZIV
John Blanch VK3ZQL
John Whitehead VK3YAC

Enquiries:
Mrs. BELLAIRS, Phone 41-3535, 478 Victoria Parade, East Melbourne, Vic., 3002. Hours: 10 a.m. to 3 p.m. only.

Advertising Representatives:
TECHNICAL NEWS PUBLICATIONS
21 Smith St., Fitzroy, Vic., 3065. Tel. 41-4902.
P.O. Box 108, Fitzroy, Vic., 3065.

Advertisement material should be sent direct to the printers by the first of each month.

Remarks should be addressed to the Editor.

Printers:
"RICHMOND CHRONICLE," Phone 42-2419.
Shakespeare Street, Richmond, Vic., 3121.

★

All matters pertaining to "A.R." other than advertising and subscriptions, should be addressed to:

THE EDITOR,
"AMATEUR RADIO,"
P.O. BOX 36,
EAST MELBOURNE, VIC., 3002.

★

Members of the W.I.A. should refer all enquiries regarding delivery of "A.R." direct to their Divisional Secretary and not to "A.R." direct. Two months' notice is required before a change of mailing address can be effected. Readers should note that any change in the address of their transmitting station must, by P.M.G. regulation, be notified to the P.M.G. in the State of residence; in addition, "A.R." should also be notified. A convenient form is provided in the "Call Book".

CONTENTS

COVER STORY

One channel of the VK Repeater, four of which will be carried on AO6. The receiver accepts signals on 146 MHz, and the transmitter gives 1 watt out on 432 MHz.

FEDERAL COMMENT

Barely a day passes but what there is a report of some form of pollution to be found in the mass news media, and as a result there is a growing public awareness of the problem and loud cries for action to have the problem abated. Generally the pollution is only too obvious, being offensive to one or more of the senses. Unfortunately various forms of pollution have been with us for so long that their eradication is going to be a long and costly process, but at least the methods are known. In the meantime, as prevention is better than cure, many industries which have been responsible for pollution have either installed or are in the process of installing the equipment necessary to remove what they have contributed to the overall problem. In many cases this action has been undertaken voluntarily, but by the same token, all too many waited until action was forced on them by legislation.

There is still one form of pollution which has received little or no public attention, indeed I doubt that more than five per cent. of the population is aware of it. I refer to electrical noise with which we, as Amateurs, are only too familiar. The sources of origin are legion, and well known to most of us, although due to our localities we suffer to varying degrees. Those near tram or train routes have their special problems, those on main roads have more trouble with auto ignition than those in quite back streets. If you live near an industrial area, no doubt you are plagued by electric welders and other industrial equipment, or you may live somewhere near high tension lines. Are you plagued by dirty insulators?

How much of this noise are you contributing to the total or have you suppressed your household electrical equipment such as the vacuum cleaner and food mixer? How much is radiated from your electric drill? True, these items should all be suppressed when manufactured, but how well has it been done? Probably it leaves much to be desired, and you have overcome your noise problem by yelling at the XYL to "turn that damned thing off". Not good engineering practice, nor is it conducive to domestic harmony!

How many of us are troubled by spots from t.v. oscillators, and why do they invariably fall on our favourite operating frequency.

To remove all the foregoing offenders is a formidable task and will certainly call for strict legislation to achieve the maximum results.

What, if anything, can we do towards achieving such a massive clean-up? We can at least make a start by cleaning up our own bands. Intruders to our small share of the spectrum are a form of pollution—report them to your Intruder Watch Co-ordinator. With sufficient suitable reports there is every chance of having them moved, but no reports—no action.

There are further forms of pollution on our bands which can be easily and cheaply eradicated. To be specific, I refer to the unmodulated carriers and carriers modulated only by whistles, or the sounds of tools being thrown around the work bench. These transmissions are neither necessary nor legal, so why not remove them. The regulations cover such transmissions and you are supposed to know the regulations. At least you have a certificate to say you do. If your memory has failed you, now is a good time to do some revision. The handbook costs only a few cents.

There was a time when the v.h.f. bands were the preserve of the more serious Amateur, and much useful work was done there. With the advent of large quantities of surplus v.h.f. equipment and the subsequent formation of the many "nets" the lower v.h.f. bands have become contaminated by large amounts of inane chatter, frequently of extremely dubious character, punctuated with language which would have automatically brought a "bluey" a few years ago. This pollution does nothing to improve the public image of the Amateur Service, and the sooner it disappears from the bands the better for everybody.

As is the case with most forms of pollution, a great amount is created by very few, but all suffer equally. Let us all, therefore, resolve to do our share towards getting our own house in order. Perhaps we can then legitimately complain about what others are doing to us.

—K. E. PINCOTT, VK3AFJ

HOME STATION ANTENNA FOR 160 METRES

PART ONE—INTRODUCTION

J. A. ADCOCK, M.I.E. (Aust.) VK3ACA*

The basic difference between a 160 metre antenna and an antenna for any other band is that the 160 metre antenna is usually much shorter than a resonant length and much lower than that desirable for maximum efficiency. For these reasons special precautions have to be taken in the design of the antenna

SUMMARY

The methods, results and conclusions given in this article are based on several years of experience on 160 metres. The main aim is to examine the basic medium frequency antennas shorter than resonant length ("T", "inverted L", sloping antenna and centre-fed horizontal). Graphs are given which have been derived from standard formulae and a number of conclusions from assumptions have been made. These conclusions have been made so that interested persons may examine them and assess their value in practice.

The article is aimed particularly at showing where horizontal and vertical polarisation is advantageous in either transmitting or receiving. Many of the curves shown could be usefully applied to 80 metre antennas. (It should be pointed out that the author is not engaged in this type of work professionally. It is an Amateur article with an electrical engineering slant.)

DEFINITIONS

The following are definitions of the terms used in this article:

A Short Antenna: In general, an antenna with each leg shorter than one-eighth wavelength, but in some cases shorter than one-quarter wavelength.

A Low Antenna: Height less than one-eighth wavelength.

Radiation Resistance (R_R): In this article radiation resistance is taken as the part of the effective series resistance of the load of the antenna at the feed point which produces radiated power.

$$\text{Radiated power} = R_R \times I^2$$

This is not the only way of taking it and in some treatments it may be the effective resistance at the current point or virtual current point of the antenna. Also, it could be the effective parallel resistance part of the load which produces radiated power.

$$\text{Radiated power} = \frac{E^2}{R_R \text{ parallel}}$$

Loss Resistance (R_L): Is the effective series resistance part of the load which produces loss.

$$\text{Power lost} = R_L \times I^2$$

Total Resistance: Is the effective series resistance of the load.

$$R = W \div I^2$$

where W = power delivered to the antenna.

$$R = R_L + R_R.$$

Effective Length of the Antenna (Ref. 1): The effective length of the antenna, used for the purpose of calculating radiation resistance, is the length of an antenna which, if carrying a constant current along its whole length equal to the current at the feed point, would radiate the same power. Where the direction of the effective antenna is not the same as the actual antenna, the component of the actual antenna is considered.

Form Factor of the Current Distribution (Ref. 1): Is the ratio of effective length to actual length of the radiating section being considered.

Surface Wave: Ground wave. The term surface wave was adopted in preference to ground wave as recommended in the A.R.R.L. "Antenna Book". In general, it refers to any part of the wave which follows the earth's surface. Dividing the wave up into direct, indirect and beyond line-of-sight are not of great importance.

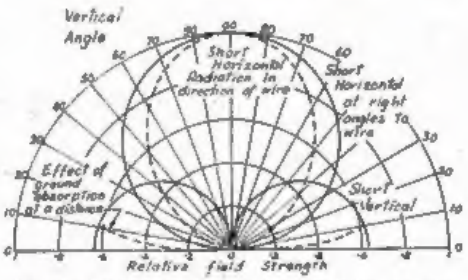


Fig. 1.—Illustrating the vertical radiation patterns of a short low horizontal and a short grounded vertical. The patterns shown are for antennas of equal radiated power. Although the pattern for the short horizontal may look attractive, in practice its efficiency is very much reduced.

HORIZONTAL AND VERTICAL POLARISATION—GENERAL

One characteristic of 160 metres is that of improved surface wave propagation. A vertical antenna will produce surface waves whereas a horizontal will produce practically no surface wave.

Vertically polarised radiation will produce good surface wave coverage during the day, whereas at night there exists a primary and secondary service area with a zone of poor reception in between, as described in standard texts on broadcast band propagation.

The horizontal antenna is rarely used commercially on medium frequencies, but it can produce useful results for the Amateur and provide coverage in the poor reception zone.

Radiation patterns in the vertical plane of a short vertical and a low short horizontal antenna are shown in Fig. 1. As can be seen from the diagram, the radiation from the vertical is zero straight up and rises to maximum horizontally, whereas the radiation from the horizontal is zero horizontally and maximum straight up.

For a vertical antenna, as far as distant radiation is concerned, the very low angle radiation is largely absorbed by the ground, as shown by the dotted line. The shape of the radiation patterns are brought about by the interaction between the direct wave and the reflected wave from the ground. This can be considered as an antenna and a virtual image of the antenna an equal distance below the ground.

Fig. 2 shows three standard antenna arrangements and the well known phenomena of how the current in the image of the vertical is in phase with the current in the antenna, but the current in the horizontal is in antiphase with that of the image. This fact is most significant.

The power radiated by a particular antenna depends on the effective current and the length of the antenna. If the antenna is short, a large current must flow in the wire in order to be effective and, by $R = W + I^2$, the resistance must necessarily be low. Similarly, if a short antenna is close to an antenna with current in the opposite phase, still more current must flow to radiate the same power and its radiation resistance will be lower still. The lower the radiation resistance, the greater the proportion of loss.

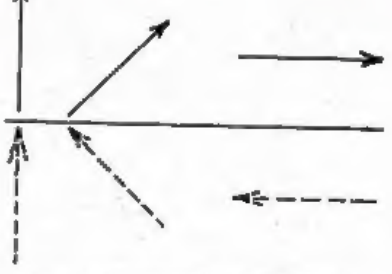


Fig. 2.—Antenna with ground image.

The resistance of a vertical antenna depends upon the radiation resistance obtained from calculation plus the series loss resistance. The resistance of a horizontal antenna depends upon the series loss resistance, the induced loss from the ground, and the radiation resistance, the latter two being greatly influenced by the height above the ground. For these reasons a low horizontal antenna is much more influenced by the ground proximity than a vertical.

(Continued on Page 13)

* P.O. Box 106, Preston, Vic., 3072.

Circuits for All—A Simple Method of Drafting*

KENNETH L. GILLESPIE,† VK3GK

Farmers, clerks, shopkeepers and anyone else you care to name are Amateur Radio operators, but the converse is not true. Amateurs, in addition to being farmers, etc., are Electronic and Mechanical Design Engineers, Repair Servicemen, Mechanics, Radio Operators and manufacturers of all types of equipment with the ability to meet and overcome a variety of problems associated with their hobby. Normally they are not Draftsmen, but why not? Isn't this just another of the various trades an Amateur should have?

Anything home constructed should have a circuit diagram for reference for future servicing or to supply a copy to another chap in need of just that particular piece of apparatus. Additionally, and this is the point of this screed, a well drawn diagram supplied separately from the text is a great help to the editor of this magazine who is always in need of articles.

NECESSARY TOOLS

What has to be done to acquire a modicum of skill in this direction, and what tools are necessary to do the job? Obviously anything from a ball point pen to a proper Indian ink pen and stencils will do.

I would suggest that each Amateur should have as part of his shack a foolscap pad of ¼" squared paper and tracing paper for a start (although a parchment type lunch wrap paper will do for the latter) plus ruler or a piece of perspex with a straight edge for drawing straight lines.

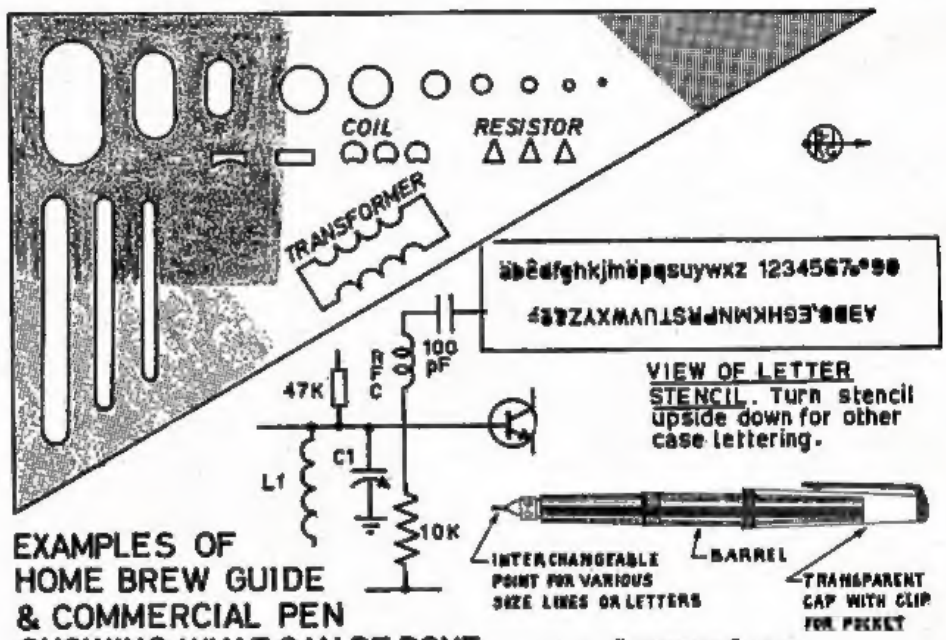
Suppose that something has been built and modified until it works properly, there are most likely working sketches scribbled on scraps of paper with the appropriate amendments found desirable also shown. These have to be made presentable. To provide the first diagram, sketch by hand the complete circuit with soft pencil on the lines of the squared paper, leaving plenty of room between components for written identification of values. No need for a ruler or square, the paper takes care of spacing, parallel and right angle lines.

While there are people for and against showing a loop where one wire crosses another, it is simpler and standard practice not to use it but draw the line straight through. The thing to remember with this, is to see that all wires that are connected to one particular wire, connect at different points so that all junctions show as a "T". This is good drawing practice anyway. These junctions are shown with a dot and this method of junctioning is valid even if the dot is accidentally omitted.

Having sketched the circuit, **check** carefully to see that it is the same as the original—if one has, or can get, someone else to check, so much the better because it is so easy to overlook something that has been missed in the first place.

Now the next part of the job, whether it is for an article or for your permanent record, is to make an ink tracing (by putting the transparent paper over the pencil drawing and tracing in ink everything that has been sketched). This time a straight edge is used to rule the lines.

To make the job easier I would suggest investing in a solid clear plastic setsquare and drilling or reaming a series of different size holes along one edge. With a ball point pen and these, circles of different diameters can be easily drawn. Make the smallest diameter suitable for junction dots, the next for switch contacts. Both in conjunction will produce a co-ax connector. Larges ones would take care of the outline of a valve or transistor.



EXAMPLES OF HOME BREW GUIDE & COMMERCIAL PEN SHOWING WHAT CAN BE DONE

PELIKAN "TECHNOS" PEN

By careful use, drawing only part of a circle at a time and sliding the square, a coil can be drawn. If a little more work is undertaken a stencil of a simplified coil, as in modern practice, can be filed out or cut with a jeweller's saw.

Resistors can be a problem, but the simple rectangle (which will also double for a condenser) is easily made or if a zig-zag type is wanted, I suggest one or two triangles be cut and the square moved longitudinally until the resistor is formed.

LETTERING

Lettering is another bugbear of the non-draftsman, but quite reasonable uppercase lettering can be done if a long slot is sawn in the square and the pen worked so that it makes contact with the bottom and top of the slot for each letter. This keeps all lettering even and of the same height because the pen cannot move further than the limits of the slot. Two or more slots will give a choice of letter size.

For reproduction, whether a dyeline, blueprint, electrostatic, photo copy or line block for printing, use a **broad** red ball point pen as this produces good contrast. **Never** use blue—it does not print. Black ball point is such a mixture of colours that it does not work as well as red.

Of course the ultimate for all drawing and lettering is Indian ink and here I suggest the Indian ink fountain pen, a drawing and writing instrument which has a hollow steel tube as its writing point. There are about four makes of these with a variety of diameters for different thickness lines. A good all round size is 0.6 mm in diameter. Use in place of ball point in the home brew stencil and be astounded at the professional result.

If one is prepared to spend more money, the same pen will fit 3.5 mm. and 4.00 mm. high letter stencils. One cheap make, "Technos," gives upper case, lower case and numerals on the one stencil. There is a secondary use (or perhaps primary) of this pen and stencil. It will make good radio panel labels, dial calibrations and goodness knows what all to the ingenious Amateur.

THE DRAWING

Coming back to "Amateur Radio" drawings, trace all of them on tracing paper to a larger size than you expect to see finished in the magazine. Look at a copy and see the width of a column or two columns and draw roughly two or three times the size. Remember

(Continued on Page 17)

* Reprinted from "Break-In," October 1970.
† P.O. Box 5, Clayton, Vic., 3168.

Crystals for Carphones—and Other Things

DAVID RANKIN, VK3QV*

In the last ten years the ready availability of commercially obsolete v.h.f. mobile transceivers has given rise to a new phase of Amateur Radio—the use of the a.m. and f.m. net frequencies with the subsequent development of v.h.f./u.h.f. Repeaters within the 52, 144 and 432 MHz. Amateur bands.

One of the elementary requirements for the successful operation of this type of equipment was that all the transmitters and receivers be tuned to the same frequency within close limits. Simple as it sounds, this was something alien to the methods of the v.h.f. Amateur of the 50s and early 1960s. Operators usually picked a crystal in the 8 MHz. range, and whatever frequency it multiplied out to within the 6 or 2 metre band became "their frequency" something to be guarded jealously. There was seldom any real thought given to achieving operation on a predetermined frequency to say within 0.005%.

CARPHONES

The appearance of cheap v.h.f. mobile transceivers—now usually known as "Carphones" after the name used commercially by one of the leading manufacturers—changed Amateur techniques because of the necessity for all units to be on the same frequency. With these Carphones, the receiver as well as the transmitter was crystal locked and no trimming controls were provided for the operator. Early thoughts were that if the same frequencies were required at the antenna, then use the same crystal frequencies in all the receivers and also the same in all the transmitters — surely the frequency marked on the crystal holder must be right. However, this philosophy was not borne out in practice, particularly where different model sets were involved. Some other factors must then be considered to explain these differences.

CRYSTAL FREQUENCY

The simplified equivalent circuit of a crystal is easily found in such well known texts as the R.S.G.B. Handbook[1] or the A.R.R.L. Handbook.[2] Suffice to say here that for the case of parallel resonance, the frequency of operation is dependent upon the total value of capacitance appearing across the terminals of the crystal whilst it is operating. In other words, the operating frequency depends upon the effective dynamic capacitance presented to the crystal.

Table 1 shows the variations in frequency obtained for different values of load (effective dynamic) capacitance and the corresponding series resonant frequency. These figures were taken on standard HC6/U plated crystals at 4 MHz., 10 MHz. and 45 MHz. The first two crystals were fundamental types —the 45 MHz. was a third overtone. The variations measured can only be taken as a guide, as the differences may be different for crystal units produced by other manufacturers.

Two points worth comment arise from consideration of the figures in Table 1:

1. The fundamental crystals measured were manufactured to suit a load capacitance of 30 pF. Refer to the third column of Table 2. The overtone crystal measured was manufactured for use at series resonance. Whilst none of the crystals oscillated precisely at nominal frequency (i.e. the required frequency on 30 pF.) they are closest to nominal with this 30 pF. load condition and series resonance, respectively. The degree by which they vary from nominal frequency when terminated into the correct circuit condition is part of the adjustment tolerance and the total amount of this permitted variation is usually quoted as a plus or minus so much percentage. Alternatively, a "parts per million" or a "Hz. per MHz." figure can be used. The "parts per million" phrase is frequently abbreviated to p.p.m. Table 3 gives some commonly accepted figures used for adjustment tolerances and states the fairly simple relationship between the three methods of quoting tolerance.

2. The variation in frequency between extreme values of load capacitance is so great that in the usual oscillator circiut, it becomes impractical to accommodate the changes required in load. Table 2 shows the frequency deviation from nominal for a typical 4 MHz. HC6/U plated crystal, and since the unit has been calibrated for a 30 pF. load, it could not be made to operate on correct frequency in a series resonant circuit unless that circuit was modified away from the series resonant condition. Again, in the case of small values of load capacity, the strays in the circuit, particularly if switching is involved, may be greater than the load capacity for which the crystal is designed. In this case, also, the crystal could not be made to oscillate on nominal frequency. Thus, in some multi-channel transceivers there are smaller values of fixed capacitance associated with the crystal oscillator than in the corresponding single channel model—the rest of the capacitance is made up of wiring capacity in the leads to the switch, and capacity in the switch itself. This approach of reduced fixed capacitors ensures that the crystals suitable for operation in the multi-channel models are also satisfactory in the single-channel versions.

Circuit Loading	Measured Frequency — KHz.		
	Nominal 4055.556 KHz.	Nominal 10,285.71 KHz.	Nominal 45,228.0 KHz.
10 pF.	4056.976 KHz.	10,289.31 KHz.	45,231.12 KHz.
20 "	4056.094 "	10,287.10 "	45,229.73 "
29.3 "	4055.556 "	not measured	not measured
29.8 "	not measured	10,285.71 KHz.	not measured
30 "	4055.526 KHz.	10,285.69 "	45,228.28 KHz.
40 "	4055.199 "	10,284.90 "	45,229.02 "
50 "	4054.988 "	10,284.38 "	45,228.90 "
60 "	4054.838 "	10,284.02 "	45,228.74 "
100 "	4054.518 "	10,283.25 "	not measured
Series Resonance	4053.960 "	10,281.91 "	45,228.22 "

Table 1.—Variations in frequency of HC-6/U style crystal units (plated) due to changes in circuit loading.

Notes.—1. At 30 pF. circuit load, the 4 MHz. crystal is 30 Hz. low of nominal frequency. Thus, the crystal has an adjustment tolerance of better than 0.0008% (8 p.p.m.).
2. The 10 MHz. crystal is 20 Hz. low of nominal frequency with a 30 pF. load and thus has an adjustment tolerance of better than 0.0002% (2 p.p.m.).
3. The measured series resonant frequency of the 45 MHz. crystal is 220 Hz. above the nominal, and thus has an adjustment tolerance of better than 5 p.p.m.

ADJUSTMENT TOLERANCE

In effect, the adjustment tolerance is an allowance given to a manufacturer who cannot be expected to produce devices that are "spot on". Resistors, capacitors, coils, etc., all have tolerances associated with their nominal values, and so also must crystals. However, in the case of a crystal unit, the user can do something about the situation. The nominal frequency can be produced by an appropriate value of load capacitance. Some thought given to the figures in Table 1 should make this clear. At some value of capacitance between 29 and 30 pF., both the 4 MHz. and 10 MHz. crystals oscillate on nominal frequency. In practice,

* 1879 Malvern Road, East Malvern, Vic., 3145.

then if a small trimmer is wired into the oscilaltor circuit, the load can be varied up or down, so that output on the precise nominal frequency can be achieved.

LOAD CAPACITANCE

Experience has shown that the best compromise for load capacitance for fundamental crystals is 30 pF. for frequencies up to 10 or 12 MHz. Initially, the U.S.A. adopted a value of 32 pF. which is somewhat academic, but the latest issues of the U.S. MIL specifications have changed to the 30 pF. value.

Circuit Loading	Measured Frequency	Deviation from Nominal Frequency	
		At 4055.556 KHz.	At 146 MHz.
10 pF.	4056.976 KHz.	+ 1420 Hz.	+ 51.1 KHz.
20 „	4056.094 „	+ 539 „	+ 19.4 „
29.3 „	4055.556 „	nil	nil
30 „	4055.526 „	— 30 Hz.	— 1.1 KHz.
40 „	4055.199 „	— 357 „	— 12.9 „
50 „	4054.988 „	— 568 „	— 20.5 „
60 „	4054.838 „	— 718 „	— 25.9 „
100 „	4054.518 „	— 1038 „	— 37.4 „
Series Resonance	4053.960 „	— 1596 „	— 57.5 „

Table 2.—An illustration of the degree of deviation from nominal frequency of HC-6/U style plated crystal with varying load capacitances. The figures are taken for the 4 MHz. crystal given in Table 1.

Note particularly how variations are emphasised at aerial frequency (146.0 MHz.) when any error is multiplied 36 times.

Thus, it is reasonable to expect that most Carphones with **unmodified** crystal oscillators require fundamental crystals calibrated for 30 pF. operation. This is true for equipment such as the A.W.A. MR6 and MR10 series and early Vinten equipment, but is not true for the Pye "Victor", "Premier" or "Overland" series. In these latter equipments, even the transmitter crystals need to be calibrated for series resonant operation; the receiver crystals are of the overtone type and require series resonance calibration, which is the recommended condition for overtone units.

3. Reference to Tables 1 and 2 will show that "30 pF." crystals will be nowhere near the required frequency if operated at series resonance in a "Victor," for example, and particularly after an 18 or 36 times multiplication, the aerial frequency can be tens of kilohertz away from the proper channel.

Other manufacturers have used load capacitance values of 20 pF., 25 pF. and even 40 pF., and here the situation may not be so serious. "30 pF. crystals" won't be quite so far off frequency and it may even be possible to pad them to frequency by modifying the oscillator—a most unrewarding and frustrating task in most instances, however. The main point, then, is that it behoves the user to make sure that he has crystals to suit his equipment. If, however, the crystals don't come out on the required frequency, then before mentally or otherwise abusing the manufacturer, the user should check out his specifications and see that he has ordered the correct capacitive load.

OTHER THINGS

Another area where the need to be precise about crystal load conditions is the oscillator crystals for modern s.s.b. receivers of the Collins, Yaesu or Drake class where frequency readout to 1 KHz. is available. A third case where precision in specification is required is where v.h.f./u.h.f. crystal-locked converters are used in conjunction with such receivers.

S.S.B. Receivers

To achieve 1 KHz. readout economically on a number of Amateur bands, modern s.s.b. receivers are of the double (at least) conversion superhet. design, where the first local oscillator is crystal locked and the second local oscillator is tunable. If the various crystals used for the different bands in the first oscillator are not specified precisely, the dial calibration will not hold from band to band.

These receivers usually have movable pointers—fidicuaries—or some similar scheme to take up small differences of the order of 1 or 2 KHz. that will occur from band to band because of the adjustment tolerances on the individual crystals. If the crystals are not specified precisely, the differences from band to band may be beyond the corrective range of the fidicuary, in which case one of the main assets of the receiver is lost. On the other hand, if trimming facilities are provided, the adjustment tolerances may be tuned out, and then the dial calibration can be made to hold from band to band within 100 or 200 Hz. at least.

For the real enthusiast, there is nothing like switching on the 100 KHz. calibrator and the b.f.o. and tuning zero beat on one of the 100 KHz. marker signals, and then "clunking" the band switch from one band to another, and finding zero beat being maintained on all bands. What joy!

V.H.F./U.H.F. Converters

With the main receiver thus aligned, it should also become a joy to operate it as a v.h.f./u.h.f. tunable i.f. Any modern converter worthy of the name is crystal locked, and thus the frequency of this locking crystal becomes important if the main receiver dial is to become in turn direct reading on the v.h.f. or u.h.f. band concerned. A fairly simple way to check the converter crystal is as follows, and let us take simple examples to illustrate the approach.

Consider a 6 metre converter that has an i.f. of 6 to 8 MHz., i.e. 52.000 MHz. is to come up on 6.000 MHz. on the receiver dial. Choose a marker signal such that a harmonic will appear on both 6.000 and 52.000 MHz. exactly. In the interests of a strong a harmonic as possible at the higher frequency, use the highest possible marker frequency. For the 6 metre converter, 2.000 MHz. is the highest possible figure that will divide evenly into both 6.000 and 52.000 MHz. Ensure that the receiver calibration is correct at 6.000 MHz. in the normal way (WWV, in-built calibrator, etc.), and then zero beat the third harmonic of 2.000 MHz. marker to the corrected 6.000 MHz. calibration. Having ensured that the 2.000 MHz. frequency is correct (within ±100 Hz. should be easily achieved), switch off the receiver calibrator and put the v.h.f./u.h.f. converter into operation and look for the 26th harmonic of 2.000 MHz. marker. Provided that the levels of the third harmonic into the main receiver and the 26th harmonic into the converter are adjusted appropriately, a beat note may be observed between these two signals at 6.000 MHz. on the dial. This, of course, is on the assumption that the converter crystal is oscillating close to its nominal frequency. In some cases this crystal may be so far off frequency that two distinct signals are heard around 6.000 MHz. The difference between the two signals will be caused by the converter crystal being off nominal frequency, and thus trimming it should bring the two signals into zero beat, provided, of course, that the converter crystal has been specified to suit the oscillator circuit in use. Once zero beat has been achieved the 6.000 MHz. dial calibration becomes 52.000 MHz. as far as the overall receiver system is concerned.

Other examples are given in Table 4. Some thought on the subject will show that since all the popular v.h.f./u.h.f.

Percentage %	Parts per Million PPM	Hz. per MHz.	Actual Variation at	
			52 MHz.	146 MHz.
± 0.01	± 100	± 100	± 5.2 KHz.	± 14.6 KHz.
± 0.005	± 50	± 50	± 2.6 „	± 7.3 „
± 0.0015	± 15	± 15	± 780 Hz.	± 2.19 „
± 0.001	± 10	± 10	± 520 „	± 1.46 „
± 0.0005	± 5	± 5	± 260 „	± 730 Hz.

Table 3.—A comparison showing the relationship between three ways of quoting tolerances on the frequency of a crystal, and also showing what these mean in terms of Hz. or KHz. at 52 and 144 MHz.

Actual variation (in Hz.) equals actual frequency (in MHz.) multiplied by p.p.m.

Actual variation (in KHz.) equals actual frequency (in MHz.) multiplied by (p.p.m. divided by 1,000).

bands start with even number frequencies, then, provided the chosen i.f. begins with an even number, a 2.000 MHz. marker signal would always provide the correct harmonics.

The principal problem arising with this scheme is the relative strengths of the marker signal at the i.f. and the v.h.f./u.h.f. The widely differing order of harmonics will have widely differing signal strengths—the higher the order of the harmonic, the weaker it will be—and thus, in practice, some method of enhancing a particular harmonic may be required. Otherwise, the weaker harmonic will be swamped by the stronger and any beat note may not be detected aurally. A diode frequency multiplier, followed by appropriate tuned circuits, is one possible solution.

CONCLUSION

Where optimum performance of Carphones is required, or the full potential of direct frequency readout on modern h.f. and v.h.f./u.h.f. receiving systems is to be realised, then careful attention must be paid to the specifications for the frequency determining crystals. Oscillator circuits in such equipment should not be modified unless the user is fully aware of **all** the implications such modifications may have. Where the circuits are standard, reference to the manufacturers' handbook should help the user to fully specify the crystals correctly.

Digital circuitry and techniques are starting to appear in the Amateur literature, and it is probably only a question of time before the "average" receiver comes equipped with digital readout of frequency. The resolution will be mainly limited by the number of readout tubes and gating times used, but fine resolution will be useless without corresponding accuracy—the frequency accuracy of the crystals in the system. Thus, the requirement for care in the specification of the operating conditions for the crystal looks like it is with us to stay, and in fact the degree of precision will increase as more exotic devices become available.

BIBLIOGRAPHY

1. "Radio Communication Handbook", 4th Edition 1968, R.S.G.B. (U.K.), chapter 1, page 32.
2. "The Radio Amateur's Handbook", 44th Edition 1967, A.R.R.L. (U.S.A.), chapter 2, page 52.
3. D. H. Rankin, "Overtone Operation of Quartz Crystals", "Amateur Radio", March 1967, page 2, and May 1967, page 5.

VHF Band	Tunable I.F.	Converter Injection Frequency	Suggested Marker Frequency	Remarks
52 to 54 MHz.	14 to 16 MHz.	38 MHz.	2 MHz.	7th harmonic on 14 MHz. 26th " " 52 "
144 to 148 MHz.	6 to 10 MHz.	46 × 3 = 138 MHz.	6 MHz.	Fundamental on 6 MHz. 24th harmonic on 144 MHz.
144 to 148 MHz.	28 to 32 MHz.	38.66 × 3 or 58 × 2 = 116 MHz.	4 MHz.	7th harmonic on 28 MHz. 36th " " 144 "
432 to 436 MHz.	27 to 31 MHz.	101.25 × 4 = 405 MHz.	9 MHz.	3rd harmonic on 27 MHz. 48th " " 432 "

Table 4.—Examples of a marker crystal frequency suitable for zeroing a v.h.f./u.h.f. converter to assure direct frequency readout on the tunable i.f. Note that the examples chosen are to illustrate this point and are not necessarily recommended as good v.h.f./u.h.f. receiver practice.

AMPLITUDE MODULATION

LECTURE No. 12

C. A. CULLINAN,* VK3AXU

When considering material for a lecture on Amplitude Modulation the following article from the "Aerovox Research Worker," Vol. 14, No. 6, was examined and found to be so fluently written that it is reproduced in full with permission of the Aerovox Corporation, U.S.A.

Note should be made that the word "tube" is used in the text for vacuum-tube or valve.

Additional material is by the lecturer

The three common methods of superimposing an audio-frequency component upon a radio-frequency carrier wave are termed frequency modulation, phase modulation, and amplitude modulation. Radio telephony and some forms of tone telegraphy are made possible by modulation processes.

In amplitude modulation, the carrier frequency is maintained constant while the carrier amplitude is varied at the audio rate. Neither frequency nor phase is more than slightly disturbed in efficiently operated systems.

Amplitude modulation is widely used [in broadcasting]. Each of the standard broadcast stations and a few of the radio telephone communication stations now in operation employ this method. Moreover, amplitude-modulated signal generators are used to align and test several million of the receivers in current use.

The appearance of an amplitude modulated carrier is shown in Fig. 1. This illustration shows the carrier voltage or current wave before and after application of the modulating component.

It is seen that both carrier and audio voltages are alternating components of widely different frequency. When the two are combined in the process of amplitude modulation, the amplitudes

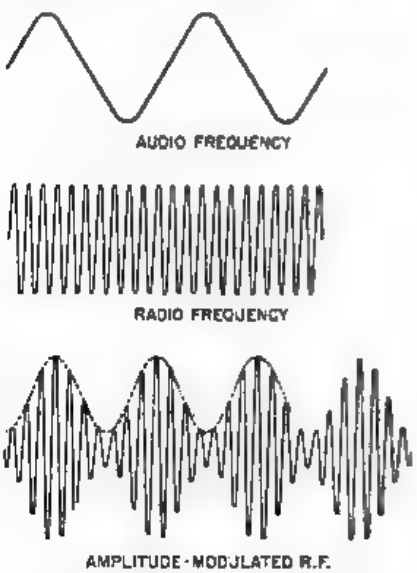


Fig. 1.

* 5 Adrian Street, Colac, Vic., 3250.

• Continuing the series of lectures by C. A. Cullinan, VK3AXU, at Broadcast Station 3CS for students studying for a P.M.G. Radio Operator's Certificate.

of successive positive and negative carrier peaks are altered in accordance, so that the "moulded" carrier traces out an envelope corresponding to the frequency and relative voltage of the audio component. The relationship of carrier and modulating voltages or currents and frequencies of these components is shown in Fig. 2. A radio-frequency carrier before modulation is shown in Fig. 2A, the modulating voltage wave in 2B and the completely modulated carrier in 2C.

In order to combine the audio and carrier components in the modulation process, the alternating a.f. voltage is actually superimposed upon one of the d.c. operating voltages of the r.f. amplifier or oscillator, generally the plate or grid voltage. Accordingly, the a.c. and d.c. voltages add on one half-cycle of audio voltage and buck on the other half-cycle. This results in an increase in the normal d.c. voltage in the first instance and a reduction in the second case.

In consequence of this action, a variable d.c. voltage is applied to one of the r.f. tube electrodes, and the r.f. carrier voltage and current will be varied at the same rate. For complete modulation, as depicted by Fig. 2, the carrier amplitude is increased, throughout the modulation envelope, to a maximum value equal to twice the unmodulated carrier amplitude and reduced to a minimum value of zero. In the conventional system operating ideally, both positive and negative carrier peaks are affected by the same amount, and the carrier frequency and phase remain unaltered.

In Fig. 2C, C is the unmodulated carrier amplitude and M the amplitude of the modulating voltage. The diagram shows the condition of complete modulation, i.e. M = C, and X = 2C. From the relationship shown, it is evident that lower values of M than that shown would fail to raise the carrier amplitude to an instantaneous value of twice its unmodulated value on positive peaks of modulating voltage, or to reduce it entirely to zero on negative peaks of modulating voltage. Similarly, higher values of M would raise amplitude C to a level more than twice its unmodulated value while completely cutting off the carrier for brief intervals during the negative modulation swing. The carrier would disappear completely at the zero line, the negative modulation peaks being lost. Consequently, the dimension D is useful for indicating the extent of the process, or modulation depth.

The degree of modulation is useful information. The effective value of amplitude modulated current increases with modulation depth. In practice, the depth of modulation is determined conveniently from the ratio of modulated to unmodulated carrier amplitudes. This ratio is known as the modulation factor.

From the diagram of Fig. 2, the modulation factor may be expressed as M/C. However, when measurements are made of successive modulated and unmodulated amplitudes, as with an oscilloscope, it is more convenient to measure each of these amplitudes with reference to the zero line rather than with respect to each other. This is because the original carrier amplitude disappears from the screen (or meter scale) during modulation. When measurements are made from zero, M is equal to the difference between the modulated and unmodulated carrier amplitudes, and the equation for modulation factor becomes:

$$\text{Modulation Factor} = \frac{X - C}{C} \quad (1)$$

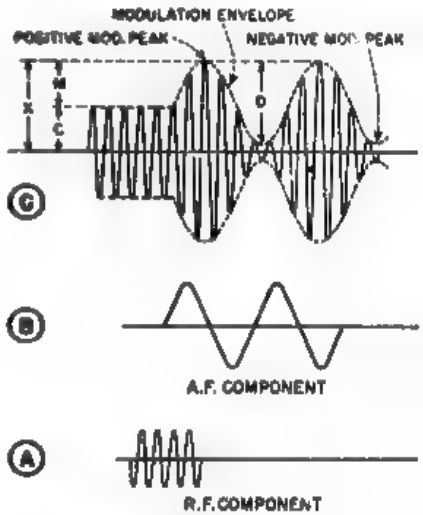


Fig. 2.

These amplitude values are determined by means of a peak-reading vacuum-tube voltmeter connected across an appropriate tuned circuit, resonant to the carrier frequency, or they may be taken directly from an oscilloscope screen in any desirable linear units of measurement.

In complete modulation, the modulation factor is 1.0. This follows from the requirement that the completely modulated carrier amplitude be exactly twice its unmodulated value, its ratio being unity. The percentage of modulation, common term for expressing modulation depth, may be obtained by multiplying the modulation factor by 100:

$$\%\ \text{Modulation} = \frac{X - C}{C} 100 \quad (2)$$

Several degrees of modulation depth are shown in Fig. 3. Fig. 3A corresponds to complete, or 100% modulation, Fig. 3B to incomplete (approximately 50%) modulation, and Fig. 3C to overmodulation (somewhat greater than 100%). Note from these voltage or current curves that the maximum and minimum modulated amplitudes are equal respectively to twice the unmodulated value and zero for 100% modulation, less than twice carrier and higher than zero for incomplete modulation, and greater than twice carrier for overmodulation. Observe also that by-products of overmodulation are the cut-off periods along the zero line.

In a completely modulated transmitter, the instantaneous antenna current or voltage is raised to twice its normal value by positive modulation peaks and decreased to zero by negative modulation peaks. The antenna resistance remains constant as long as the carrier frequency is not shifted; so the power in the modulated wave is directly proportional to the square of the modulated carrier voltage or current ($P = E^2 \div R = I^2R$). In any carrier that is modulated 100% by the amplitude method, the instantaneous peak power is therefore four times the unmodulated carrier power. The completely modulated amplifier or oscillator must be capable of supplying this increased peak power output.

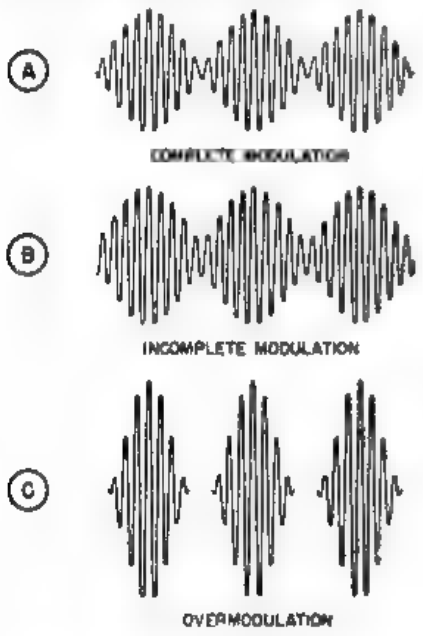


Fig. 3

ADVANTAGES OF COMPLETE MODULATION

The audio-frequency voltage and power delivered by the detector in a radio receiver is proportional to the amplitude of the modulating voltage. This voltage is equivalent in magnitude and frequency to the modulation envelope. In order to obtain the largest undistorted detector output for a given carrier, the largest permissible a.f. voltage must be employed in the modulation process—which is another way of stating that the highest permissible values of modulation depth, modulation factor, or modulation percentage give the highest undistorted detector output levels.

100% modulation is the maximum permissible depth which may be applied to any carrier wave, since this percentage allows the carrier amplitude to be swung between zero and twice its normal value, the maximum safe limits. Higher percentages of modulation have already been shown to introduce cut-off periods (Fig. 3C), which because of the high damping they introduce, cause broad tuning. Frequency distortion, resulting from loss of the negative modulating voltage peaks and deviation of the carrier frequency during modulation, are also by-products of excessive modulation depth.

Complete modulation of a transmitter reduces heterodyne interference at distant points, improves the signal strength (and signal-to-noise ratio) in receivers in the service area, and affords a better increase in the station's service area than might be gained by reasonable increases in the transmitter carrier power. An audio increase of only 3 db., for example, is equivalent to doubling the carrier power. 100% modulation makes the most effective use of a carrier in the most economical manner.

SIDEBAND GENERATION

One of the by-products of normal amplitude modulation is the heterodyne effect between the a.f. and r.f. components. As is the case when any two frequencies are combined, two beat notes are set up by the modulation process, due to interaction of carrier and modulating voltages. One of these beats is equal to the sum of the two frequencies, and the other to their difference. Consequently, two radio frequencies other than the transmitter or oscillator carrier are generated by the modulation process; one being equal to the carrier plus the modulating frequency—the other to the carrier minus the modulating frequency. These are the well known side frequencies, lying one above and one below the carrier, which set the limits of the side bands. The intelligence is conveyed by these side bands.

Fig. 4

The initial phases of carrier, upper side frequency, and lower side frequency are 0, —90, and +90 degrees. These phase relationships are represented vectorially in Fig. 4, where the components are either peak or effective carrier voltage and side-frequency voltages. S_U and S_L are the upper and lower side-frequency voltages, respectively, while C is the carrier voltage. With respect to the carrier vector, C, S_U rotates counter-clockwise, while S_L rotates clockwise. At maximum modulated amplitude, the side-frequency vectors are in phase with the carrier vector; at minimum modulated amplitude, 180° out of phase. With respect to the magnitudes of the side-frequency voltages or currents, the modulation percentage is:

$$\% \text{ Modulation} = \frac{S_u + S_L}{C} 100 \quad (3)$$

The channel width of an amplitude modulated emission is fixed by the separation of the upper and lower side frequencies and is the total width of the side bands so delineated. The channel width is thus twice the frequency of the modulating voltage. When the latter contains several frequencies, as in speech or music modulation, the highest modulating frequency in the complex group determines the maximum side band width.

AMPLITUDE MODULATION CIRCUITS

Fig. 5 shows various circuits for amplitude modulation. Fig. 5A and 5B are arranged for plate modulation of the r.f. tube; Fig. 5C for grid-bias modulation; Fig. 5D, cathode modulation; and Fig. 5E, suppressor modulation.

Plate modulation may be constant current or constant voltage in type. In the former case, the modulator delivers audio-frequency power to the r.f. tube. In the constant voltage system, the modulator may be considered equivalent to an audio operated resistor in series with the d.c. plate voltage of the r.f. tube.

Heising Modulation

Fig. 5A is the Heising or constant current circuit. In this arrangement, d.c. power is supplied to both r.f. and modulator tubes through the iron-core reactor L by the common source E_P. The modulator plate current is maintained by the d.c. grid voltage of the modulator at the same value as the r.f. tube plate current

Variations in the modulator grid voltage (produced by excitation from the audio amplifier) cause corresponding changes in the modulator plate current, an increase in the negative value causing a reduction in plate current, while a reduction in the negative value (or positive grid swing) causes the plate current to rise. These plate current variations give rise to induced voltages in the reactor L, which are in the proper direction with respect to E_P to maintain the supply current steady. When the modulator plate current increases, the amplifier plate current must decrease, and vice versa. The total current thus remains constant through the action of the reactor, while audio-frequency variations in the plate current of the r.f. tube produce corresponding variations in the carrier

For 100% modulation, the r.f. amplitude is modulated between twice its resting value and zero. In order to accomplish this in the Heising circuit, several modulator tubes would need to be connected in parallel to reduce the modulator plate resistance. (Actually, in order to secure complete modulation, the plate resistance would have to be reduced to zero.) Or the modulator plate must be operated at a higher

voltage than that of the r.f. tube. The latter method is most common and is accomplished by the series dropping resistor R which is shunted by the capacitor C, the function of the latter being to pass the audio voltage.

Plate Modulation

Fig. 5B shows plate modulation employing a coupling transformer. The modulator may be a class A, class B or class AB amplifier of sufficient power capability. Here the a.f. power is superimposed upon the d.c. plate power input to the r.f. tube by means of the transformer. The audio voltage is thus effectively in series with the d.c. plate voltage of the r.f. tube. The voltage required for complete modulation depends upon the a.f. voltage in the transformer primary, the turns ratio of the transformer, and the maximum d.c. power input to the plate of the r.f. tube. When the a.f. power output is sufficient, complete modulation with low distortion and good linearity is obtained when the impedances of modulator and r.f. tube plate circuits are matched through the coupling transformer.

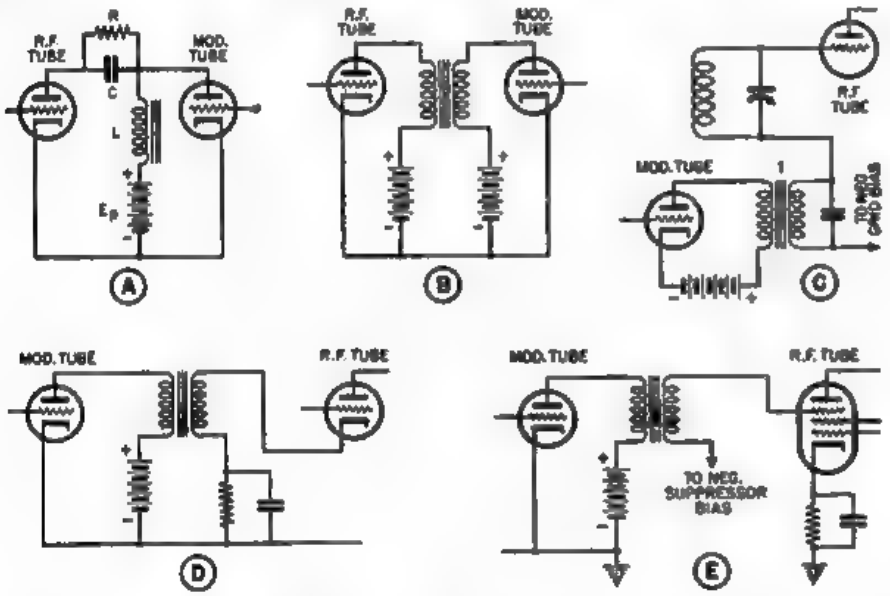


Fig. 5.

In plate-modulated systems, the audio power which must be supplied by the modulator is equal to one-half the d.c. plate power input to the r.f. stage. It is clear from the foregoing explanations that since the instantaneous plate voltage of an r.f. tube under 100% modulation will be increased to twice its normal value, the tube must dissipate a detrimental amount of power unless its "resting" plate voltage is reduced to a safe value. For this reason tube tables indicate a lower value of plate voltage for telephony and modulated telegraphy than for unmodulated services.

Grid Modulation

Fig. 5C shows a grid-bias modulation circuit. Here, audio frequencies are introduced into the grid circuit of the r.f. tube through the coupling transformer T. This system utilises variations in the grid-bias of the r.f. tube to secure amplitude modulation of the carrier. The peak grid voltage is varied by varying the d.c. bias at the audio-frequency rate, and the average power output is increased by the modulation process, although the d.c. plate power input remains constant. Operating voltages and currents must be maintained at specific values in order to obtain good linearity of modulation. Especially important is the location along the grid characteristic at which the tube is operated. These values are such that the plate circuit efficiency of a grid-modulated stage is reduced to approximately one-half that of a plate-modulated stage. 35% is usual with grid modulation. Both excitation and bias voltages are set considerably lower than corresponding characteristics in class C operation.

The carrier efficiency in a grid-bias modulated system is highest at the modulation peak. The carrier must be maintained at a value which is equal to half of its peak voltage, the modulated values being then swung up and down about this particular value. The carrier efficiency is accordingly termed one-half the theoretical possible efficiency. Actually, however, the efficiency of grid-modulated r.f. amplifiers is approximately 35%. An advantage of the system is its low a.f. and r.f. power requirements. Very small audio levels will completely modulate the amplifier, while the actual r.f. excitation power reaching the grid need be sufficient only to overcome the grid losses.

Cathode Modulation

A typical cathode-modulated ampliger is shown in Fig. 5D. In this circuit, the audio voltage is impressed across the cathode circuit. The cathode-modulated circuit may be considered to divide the modulation between plate and grid, the carrier efficiency being, as a result, intermediate between the two and usually 45%. Variations occur in both grid-bias and plate voltage during modulation.

Since the presence of a small amount of grid-bias modulation in this system tends to make the circuit behave somewhat as a grid-bias modulated stage, the output will not be so high as with plate modulation. The percentage of grid modulation is purposely kept small to increase the carrier efficiency. The percentage of grid modulation may be controlled by adjustment of the grid leak resistance and the position of the grid return along the tapped secondary of the cathode modulation transformer.

As the percentage of plate modulation is increased, the required audio power (from the modulator) and r.f. excitation likewise increase, although both of these requirements will be small as compared to those of plate modulation circuits.

Suppressor Modulation

Fig. 5E shows the circuit for suppressor modulation of r.f. pentodes. Here, the audio-frequency component is introduced through the coupling transformer in series with the negative d.c. suppressor bias. An extremely small amount of audio power is required to modulate an amplifier in this fashion, but the carrier efficiency, as in grid-bias modulation, is only about 35%, and distortion increases above 80% modulation.

The preceding material from Aerovox has shown how Amplitude Modulation is accomplished, however, there are several modes of transmission of this type of modulation.

In the above discussion we have seen that there is a radio frequency carrier and two symmetrical sidebands. This is the type of signal which is transmitted by broadcasting stations and many other stations using amplitude modulation. However, it is possible to transmit variations for special purposes.

DOUBLE SIDEBAND SUPPRESSED CARRIER (D.S.B.S.C. or D.S.B.)

During or after the modulation process the carrier is removed and only the sidebands are transmitted. These will be centred on the carrier frequency. The main advantage of this and other suppressed carrier systems is that there is no carrier to produce audible interference beats in receivers. However, there are disadvantages in that an artificial carrier has to be inserted in the receiver. This carrier must be very close in frequency to the original or to the receiver i.f. frequency, if a super heterodyne type, also it must be reasonably accurately phased and must be of the same level or ratio to the sidebands, as existed in the transmitter.

The disadvantages outweigh the advantages for broadcasting, but the system is used in Amateur and some Commercial systems.

SINGLE SIDEBAND SUPPRESSED CARRIER (S.S.B.S.C. or S.S.B.)

There are several methods of doing this, but all start off with amplitude modulation. The two most popular methods of obtaining S.S.B. are the Filter method and the Phasing method.

In the filter method the radio frequency carrier is amplitude modulated, then either during the modulation process, or afterwards, the carrier is removed as in d.s.b. One of the sidebands is then passed through a filter whose selectivity curve has very steep sides

and a flat top. The advantages of this type of transmission are that interference is minimised because of the absence of the carrier, also there is a considerable saving in spectrum space as only one sideband is transmitted.

In the phasing system the r.f. carrier and the a.f. signals are split and phased in such a manner that the carrier cancels itself and one of the sidebands is cancelled, leaving a single sideband with suppressed carrier.

The disadvantages are similar to that of d.s.b. It is interesting to note that in the early days of broadcasting in U.S.A serious consideration was given to standardising all broadcasting stations to use single sideband suppressed carrier transmission. However, this proposal failed because of the difficulty in making satisfactory receivers.

In recent years great advances have been made in receiver design and with a modern receiver the tuning in of an s.s.b. signal is nearly as easy as with tuning a normal receiver to a broadcasting station.

The great savings to be obtained in the use of the shortwave portion of the spectrum, through the use of s.s.b., have resulted in changes to be made in the Australian short wave radio.

Gradually all radio telephony transmissions in Australia, except Amateur and short wave broadcasting, must use s.s.b. in the s.w. and v.h.f. bands in place of existing a.m. systems except where angle modulation is the preferred method.

COMPATIBLE SINGLE SIDEBAND

This is a very intricate method of transmitting high quality speech and music from a medium frequency broadcasting station. One sideband and the carrier are transmitted so that the signal can be received with an ordinary domestic receiver. The system has been used experimentally. Its only advantage is the saving in spectrum space because of the removal of one sideband.

There is a slight disadvantage in that the receiver tuning is a little bit different.

TELEVISION

The vision portion of a television signal is amplitude modulated by one of the methods outlined earlier to produce a double sideband and full carrier signal. Then either by de-tuning methods or the use of a vestigial sideband filter, most of one sideband is removed. The resultant t.v. vision signal then comprises the full carrier, one full sideband and a small amount of the other sideband.

Again spectrum space is saved and receivers are easy to tune.

INDEPENDENT SIDEBAND

Essentially this is a method of transmitting a double sideband signal, but as distinct from d.s.b. described earlier, the individual sidebands contain different intelligence.

As has been shown, there are several methods of obtaining amplitude modulation and the method used will depend on many factors, which in the commercial field may involve patents.

If a very wide-band modulating signal is to be used, such as the vision signals in television, then it is usual to employ grid modulation in an early stage of the transmitter and follow this with one or more linear amplifiers to raise the r.f. output to the desired level.

However, where the bandwidth of the modulating signal is confined to the audio frequencies and high power efficiency is desired, it is usual to employ a plate modulated class C r.f. amplifier which is modulated by an audio-frequency signal supplied by a class B a.f. amplifier, usually known as a class B modulator.

Class B a.f. and class C r.f. amplifiers were defined in Lecture No. 10 dealing with Harmonics.

The class C modulated amplifier of a typical m.f. broadcasting transmitter operates as follows:

D.C. Plate Voltage	3000 V.
D.C. Plate Current	1.0 A.
D.C. Plate Input	3 KW.
R.F. Output	2.220 KW.
Plate Efficiency	72%

In contrast to many services where the maximum licensed power is that taken by the final r.f. amplifier stage in the transmitter, m.f. broadcasting stations in Australia are licensed for a particular power into the actual aerial system under conditions of no modulation.

For the transmitter just mentioned, the licensed aerial power is 2000 watts and the difference between this and the transmitter output (220 watts) is the power lost in the transmission line and the aerial coupling unit.

The Australian Broadcasting Control Board, in its Standards for Technical Operation of Medium Frequency Broadcasting Stations, second edition, requires that the aerial input power measured at the aerial driving point shall not differ at any time by more than ±10% of the authorised power for an omnidirectional aerial.

In the case of directional aerials it is virtually impossible to make accurate impedance measurements of each element of the whole aerial system whilst it is in operation because any attempt to make such a measurement will upset the aerial adjustments. The impedance of the elements may vary greatly when energised from that which exists when they are not energised.

For instance, the measured impedance of the 3CS East aerial (not energised) is 107 ohms + J124 at 1130 KHz. with the West aerial open circuited.

If the West aerial is earthed, the East aerial figures become 96 ohms + J120 at 1130 KHz.

However, when the aerial array is energised the impedance of the East mast changes to 50 ohms ± J0 at 1130 KHz. This is a calculated figure, not measured.

Because of these difficulties with a directional aerial system, the A.B.C.B. permits the measured power at the input of the common driving point to be maintained at 1.05 times the authorised power and it must not vary at any time more than +15.5% or —5.5%.

In these circumstances the aerial power is deemed to be +10% of the authorised power.

ANTENNA FOR 160 METRES

(Continued from Page 3)

In practice little surface wave radiation can be produced by a horizontal antenna on 160 metres [60 dB. down as compared with a vertical has been suggested (Ref. 2)]. A horizontal antenna can be caused to inadvertently produce vertical polarisation as pointed out in the section on "Vertical versus Horizontal for Receiving", which accounts for why some apparently horizontal antenna signals are received locally at good strength. Also, horizontal antennas can produce considerable sky wave propagation at night which can be received locally with some fading.

(Note.—A horizontal antenna can produce satisfactory surface propagation only if both the receiving antenna and transmitting antenna are several wavelengths above the ground—quite impossible on 160 metres—or if the receiving antenna is only several wavelengths from the transmitter. In practical cases horizontal polarisation is unsuitable for surface wave propagation beyond several miles.)

REFERENCES

1. The use of the terms effective length, form factor and some of the symbols were taken from the "Admiralty Handbook of Wireless Telegraphy," 1938, Sections R10, R11 and R12. The term effective length is also referred to as radiation length or radiation height.
2. R.S.G.B. Handbook 1968, diagram, Fig. 13.9.

☆

AWARDS

FIRST INTERNATIONAL ROSE SHOW AWARD—NOVEMBER 1971

The Award is sponsored by the Hamilton Radio Club Branch 13 of N.Z.A.R.T. in accordance with the following rules.

Overseas Stations: To QSO 10 Hamilton stations on any band or mode.

Copy of log giving date, time, frequency, your call sign and call sign of station QSOed and certified by two other Amateurs is the only confirmation required.

Award opens 1st May, 1971, and closes 30th November, 1971, both days being inclusive for Award.

Cost of Award Overseas stations, 6 IRCs.

Requests for Award must be sent to Award Committee, Hamilton Radio Club, P.O. Box 88, Hamilton, New Zealand.

VK SOUTH-WEST CERTIFICATE

Due to the popularity of the South West Certificate, commemorating the Captain Cook Bi-Centenary and the Wagga Wagga Centenary, we are going to re-issue, on a continuous basis, a further series of attractive certificates.

These certificates will be awarded to any Amateur who contacts seven South West Area stations on any band or mode, after the 1st April, 1971.

To receive the Award, please send your logs to the Secretary, South West Area, P.O. Box 351, Wagga Wagga, N.S.W., 2650.

— . . . —

LICENSED AMATEURS IN VK

DECEMBER 1970

	Full	Lim.	Total	
VK0	11	1	12	
VK1	83	30	113	
VK2	1402	457	1859	
VK3	1318	650	1968	
VK4	525	196	721	
VK5	518	236	754	
VK6	361	136	497	
VK7	164	68	232	
VK8	27	12	49	
VK9	89	7	96	
	4508	1793	6301	Grand Total

FREQUENCY MEASURING EQUIPMENT

The following is a copy of a letter from the Director-General, P.M.G. Radio Branch, to the Federal Secretary, W.I.A.:

Amateur Radio Operators
Requirement to Possess Frequency Measuring Equipment

Dear Mr. Williams,

As you know, Wireless Telegraphy Regulation 59 and Section 54 of the Amateur Handbook state that an Amateur licensee is required to have available at his station frequency measuring equipment capable of verifying that emissions are within authorised Amateur bands.

This requirement was recently reviewed and it has now been decided that the conditions governing the licensing and operation of Amateur radio stations should not make it mandatory for the licensee of any such station, or for an applicant for a licence for any such station, to possess a specific piece of frequency measuring equipment. The view is now held that it is sufficient to provide that the licensee must ensure that emissions from his station are within the limit of the Amateur frequency band in which he is operating.

It is proposed to amend the Wireless Telegraphy Regulations, the Amateur Handbook and other appropriate documents as soon as practicable. The new policy, however, will be adopted forthwith and licensees of Amateur stations may be informed accordingly.

—Director-General,
P.M.G. Radio Branch.

— . . . —

WHEN VISITING AUCKLAND, N.Z.

Federal Secretary, W.I.A.,

Dear OM,

As the Secretary of the Auckland Regional Co-ordinating Committee (a group comprising representatives of the various Branches of N.Z.A.R.T. here in Auckland), I have been requested to write to you on the following matters:

On many occasions overseas Amateurs visiting our two countries do not know how to go about meeting local Amateurs and we should like to have the names and addresses (with telephone numbers) of an Amateur in both Sydney and Melbourne to whom we could direct overseas Amateurs (visiting Auckland and N.Z.) en route to Australia.

At 24 hours' notice recently we were able to arrange a gathering of about 40 Amateurs when Brian Armstrong, G3EDD, Executive Vice-President of R.S.G.B. was in Auckland for a few days and he told us of his meeting with officers of your Institute.

The following information is provided in the event of your knowing of prospective visitors to Auckland:

Mr. W. S. Chester, ZL1OD,
404 Mt. Albert Road,
Mt. Roskill, Auckland.
(Telephone 699-855)

or—

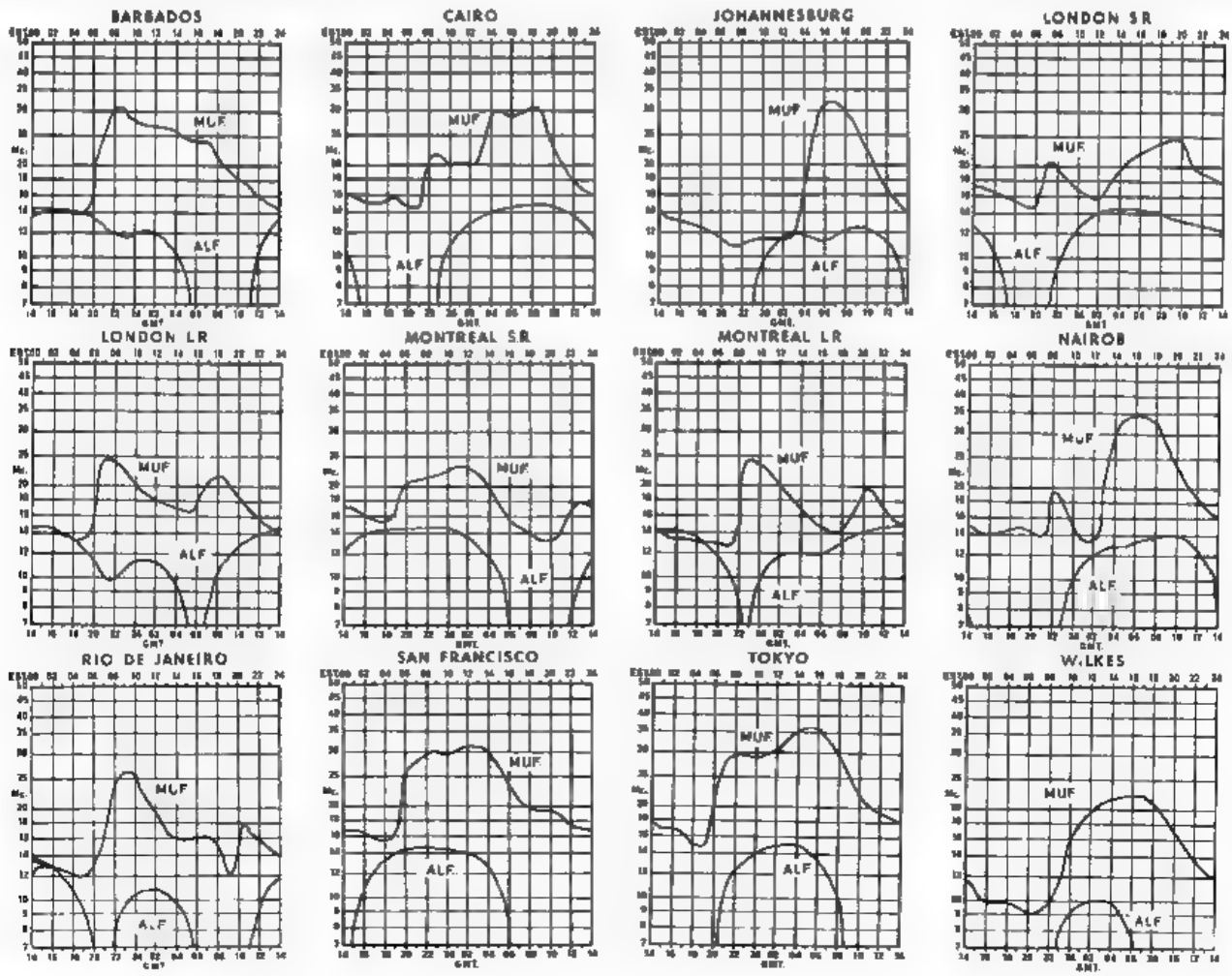
Mr. M. H. Churton, ZL1TB,
15 Grassways Avenue,
Pakuranga, Auckland.
(Telephone 577-939)

Thanking you in anticipation for your attention to this reqeust,

Mark H. Churton, ZL1TB.

PREDICTION CHARTS FOR MAY 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)



CONTEST RESULTS:

1971 John Moyle Memorial National Field Day

SIX-HOUR DIVISION

Section A:

VK2RJ/P	144	points
VK3ZA/P	773	„
3BBC/P	737	„
3AGF/P	547	„
3EF/P	317	„
3ASV/P	236	„
3NX/P	209	„
3ZQC/P	91	„
3NR/P	36	„
VK4GT/P	713	„
4XV/P	483	„
4PJ/P	222	„
VK5WC/P	600	„
5ZCR/P	170	„
5LP/P	135	„
5DZ/P	90	„
VK6AB/P	693	„

Section B:

VK2YB/P	121	points
2JM/P	109	„

Section C:

VK3TX/P	237	points

Section D:

VK5ZID/P	212	points

Section E:

VK3XB	605	points
3AUN	305	„
3KR	165	„
VK4PV	[illegible]	„
VK6AI	310	„
VK9GA	180	„

Section F:

L4018—G. Thorpe	395	points
VK4—C. Andrews	190	„
L5096—C. Hannaford	675	„
L5132—D. Vale	390	„
L6218—M. Bosma	395	„
L7043—R. Everett	345	„

24-HOUR DIVISION

Section A:

VK2ZCT/P	116	points
3BBB/P	1144	„
VK4ZQ/P	1803	„
4IE/P	1222	„
4AL/P	965	„
VK6VB/P	655	„
6MM/P	24	„

Section B:

No entry.

Section C:

VK3ADP/P	1525	points
3EZ/P	660	„

Section D:

VK1ACA/P	2276	points
1VP/P	2233	„
VK2WG/P	1985	„
2ATZ/P	835	„
VK3APC/P	6010	„
3ATO/P	4456	„
3ATL/P	2578	„
3ATM/P	2048	„
3XK/P	1914	„
VK5WV/P	2653	„
5LP/P	1575	„
VK6VF/P	606	„

Section E:

VK3AYL	405	points

Section F:

L3458—G. Latch	850	points
L3042—E. Trebilcock	[illegible]	„
L4104—K. Cunningham	525	„

Ross Hull Memorial V.h.f. Contest, 1970-71

TROPHY WINNER

VK4ZFB—D. F. BLANCH

INDIVIDUAL RESULTS

Section	Call Sign	7-Day Score	48-Hour Score
B	**VK1ZMR**	**1132**	**561**
B	VK1VP	715	340
B	**VK2ZFB**	**1227**	**291**
B	VK2BHL	733	[illegible]
B	VK2ZQJ	636	[illegible]
B	VK2HZ	[illegible]	270
B	VK2BMX	492	
B	VK2ZTQ	234	80
B	VK2ZMV	41	
B	**VK3TN**	**1777**	**536**
B	VK3AKC	1314	348
B	VK3ASV	1087	308
B	VK3ZKN	1023	
B	VK3BDA	983	357
A	VK3AOT	[illegible]	571
B	VK3ZYO	[illegible]	253
B	VK3YEJ	555	160
B	VK3BBB	[illegible]	
B	**VK4ZFB**	**2552**	[illegible]
B	**VK4ZAM**	**1395**	[illegible]
B	VK4ZTL	901	375
B	VK4ZJB	896	
B	VK4RO	775	360
B	VK4ZTK	501	[illegible]
B	VK4ZLC	445	331
B	**VK5ZMJ**	**1380**	**460**
B	VK5LP	935	615
B	VK5ZLZ	836	379
B	VK5DK	805	
B	VK5ZKJ	724	224
B	VK5ZDU	330	
B	VK5MY	266	70
B	**VK6ZFF**	**703**	**206**
B	VK6ZCD	651	240
B	**VK7ZBY**	**2475**	**647**
B	**VK8KK**	**475**	**425**
B	**ZL3RZ**	**630**	**450**
B	**C21AA**	**235**	

LISTENERS

Section			
C	L2074	J. Hillard	618
C	L2259	B. Vernon	[illegible]
C	**L5088**	**S. Ruediger**	**1405**

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers

NEW TERMINOLOGY

Editor "A.R.," Dear Sir,

Being an old tube man from way back, I find myself becoming ever more deeply imbedded in the quicksands of solid state terminology. There seems to be a conspiracy amongst the solid state boffins to keep us oldies and many of the youngies out of the higher echelons of solid state simply by the production of an entirely new vocabulary for which no comprehensive dictionary exists.

It would appear that any device, be it a simple RC circuit or some more complex device such as a buffered bi-stable, concerned with a computer or similar device becomes a "Logic" element. Fair enough.

I also concede that abbreviations are in order if text and device descriptions are not to become too unwieldly, hence an RC circuit can be called RCL, a device using two diodes can be DDL, mixtures of diodes and transistors DTL, and exclusively transistorised devices TTL. But what, for instance, is the difference between a "Decoder Driver" and a "Decorder Driver"?

I can wend my way through most circuits using discreet devices, but when it comes to ICs, brother! am I in trouble. I find that the information sheets put out by the makers do not help very much either, most of them show an illustration of a little black box with sundry leads projecting therefrom and some, to me, incomprehensible data, relating to temperature rise plus some suggested external connections, but very little information regarding what goes on within said little black box.

So, Sir, how about having some of the knowledgable fellows pitch in and produce some explanations and perhaps a glossary of terms, to help us old bottle merchants.

When it comes to DDL, TTL, DTL, etc., perhaps I should have remained a BCL.

—B. L. McCubbin, VK3SO.

P.S.—Solid-state engineers please note, BCL equals Broadcast Listener

[Mr. McCubbin is not alone with this problem, so how about it you solid-state engineers. —Ed.]

☆

IPS-H5 HANDBOOK

FOR USE WITH IONOSPHERIC PREDICTION SERVICES

We have been advised by the Ionospheric Prediction Service that copies of this Handbook have been made available to all Divisions of the Institute, the Darwin Radio Club and the Canberra Radio Society

The Handbook contains a considerable amount of information on the preparation and use of Prediction Charts and those of our readers who make regular use of the charts which we reproduce will find the book of considerable interest, whilst others will find much to interest them in the descriptions of other atmospheric phenomena which can influence radio propagation.

A number of copies have been supplied to each Division for library use, and you should apply to them for a loan of this publication.

Please DO NOT ask the Prediction Service for a copy as the Assistant Director of I.P.S. has already indicated that it is impossible to send copies to individuals.

☆

GREAT CIRCLE MAPS

Several maps have been returned by the postal authorities because the labels with names and addresses fell off. It is requested that anybody who has not received their map will write a brief note stating the fact to Secretary, W.I.A., P.O. Box 36, East Melbourne, Vic., 3002, and the maps will be re-posted.

Australian Standards for Electro-Magnetic Interference*

(The following article is condensed from a paper prepared by Mr. R. Profitt, officer in charge of S.A.A's Telecommunications and Electronics Industry Standards Committee, for presentation at the 1971 Radio Interference Workshop of the University of New South Wales on 10th March, 1971. Mr. Profitt covered recent work of the Association's Committee on Radio Interference and, in particular, the five draft standards now out for public review.)

E.M.I. Terminology (Doc. 1679)

The need for standard terms, definitions and concepts is obvious. Without such a document standards would be meaningless, since without standard terms, we cannot guarantee understanding of the concepts being discussed. Without mutual understanding of the meaning expressed by a word or phrase there can be no communication. Doc. 1679 represents international thinking on the meaning of electromagnetic terms and concepts.

Limits of E.M.I. for Electrical Appliances and Equipment (Doc. 1693)

This draft is a proposed revision of AS C321. It has not greatly changed the original standard but attempts to be much more specific about the appliances and equipment coming within its scope. The limits are much tighter than the C.I.S.P.R. Recommendations for similar classes of equipment, but the committee believes for good reasons. In Australia it is necessary to protect many essential services at field strengths considerably below those used in Europe or North America. For this reason tighter limits must be placed on equipment likely to produce interfering radiation.

Despite the fact that the limits are much lower than those proposed by C.I.S.P.R., they are in fact similar to many other national limits and are considered to be economically achievable.

Electro-Magnetic Measuring Apparatus for the Frequency Range 0.15 to 1000 MHz. (Doc. 1694)

This draft, if accepted, will replace AS C345 and C346, which are endorsements of Part 1 of C.I.S.P.R. Publications 1 and 2 respectively. These endorsements will then be withdrawn.

The committee is not, however, proposing to place the C.I.S.P.R. concept entirely. The proposed standard is based on BS 727 : 1967, and like it, specifies three basic types of measuring equipment:

(a) A quasi-peak measuring set for the complete range.

(b) A peak measuring set for the complete range.

(c) A measuring set for sine-wave interference.

The quasi-peak measuring set is intended to measure broad band interference to amplitude-modulated telephony. The correlation between measured values and subjective annoyance is less close for other forms of radio communication, but is considered adequate for the assessment of interference to most forms of radio and television broadcasting.

For some more specialised applications, particularly in the military and aeronautical fields, peak measuring sets are prefarred. The peak reading specification closely follows the quasi-peak equipment, wherever it is applicable, but the bandwidths are changed in terms of current practice and available measuring equipment.

The sine-wave section has been included particularly for the measurement of interference from industrial, medical and scientific radio frequency equipment. The equipment is much simpler than for the two other forms except where it may be necessary to take precautions to protect the measuring set by improving the rejection of unwanted signals.

Radio Interference Limits and Measurements for Television and Sound Receivers (Doc. 1695)

This draft was produced largely to provide for the protection of sound and vision signals in the range 0.15-1000 MHz. by—

(a) Setting limits for the radiated and conducted radio interferences produced by the receivers.

(b) Specifying a method of measurement for establishing compliance with these limits.

Once again the limits for radiated interference are tighter than those proposed by C.I.S.P.R., for the same reasons as given previously. It is considered that they are economically attainable, based on the results of tests carried out by the Australian Broadcasting Control Board some years ago. In fact they represent some relaxation of the Board's recommendations as given in their handbook on the subject published in 1966 and re-issued in 1961.

It is expected, however, that there will be some concern about these limits and specific comment has been requested on this subject.

Electro-Magnetic Limits of Interference for Semiconductor Control Devices (Doc. 1696)

This draft proposes limits for the amount of radiated interference produced by low-current thyristor controls for such items as light-dimmers, speed controllers, or temperature controllers. The methods of measurement proposed are not suitable for measuring devices controlling currents in excess of 10 amperes and are suspect for units using very fast rise times.

For these reasons two methods of measurement have been suggested and specific comment requested regarding the suitability of one or the other for the purpose proposed.

The limits are again tighter than those proposed overseas, in order to line up with those included in the revision of C321. These limits, too, are considered economically attainable within the framework of current technology. It is claimed that developments in this field will almost eliminate the problem within a few years. The problem of industrial controls, handling thousands of amperes will, however, be with us for many years. Extension of this standard to cover the whole field of semiconductor control will be essential, on the basis of present experience.

Electro-Magnetic Compatibility

The concept of electro-magnetic compatibility (E.M.C.) is now fairly widely understood. The philosophy of basing future Australian standards on this concept has been accepted by the Executive of the Telecommunications Industry Standards Committee. The Committee on Radio Interference will be renamed the Committee on Electro-Magnetic Compatibility and will be given the responsibility of writing proposed Australian standards based on the mutual compatibility of electromagnetic equipment and systems.

The only standards which approach the problem of interference in this way at present are the U.S. MIL Standards of the 400 series. The relative speed with which these standards have been revised and re-issued since they were first introduced in 1957 indicates that there is a great deal to learn about E.M.C. before we can standardise the concept and techniques associated with this philosophy.

The basis of the E.M.C. concept is the relative immunity of an equipment to electromagnetic interference, which may be either conducted or radiated, and generated either externally or within the equipment itself. This latter condition is a problem of the newer solid-state circuitry.

Immunity itself is a concept still to be standardised. The British have defined immunity as the ability of the receiver to discriminate in favour of a wanted signal over an unwanted signal at the tuned frequency.

C.I.S.P.R. have not yet defined immunity, as such, but have introduced the term "mains interference immunity factor" to replace "mains interference ratio". Mains interference immunity is defined as the degree of protection of a radio receiver against interference conducted by its supply mains under specified conditions.

The I.E.C. still use the term "susceptibility" in the title of a working group of TC 12A, Susceptibility of Receivers to Interference. However, the working group is reported to be studying such topics as the "susceptibility of broadcast receivers to interference" along with "the measurement of immunity of television receivers with balanced and unbalanced inputs". It is obvious that some rationalisation will be necessary at the sub-committee stage if these documents are to be compatible.

* Reprinted from Standards Association of Australia "Monthly Information Sheet," Feb. 1971.

METHOD OF DRAFTING

(Continued from Page 5)

wide lines because the thickness is reduced as well as the drawing. Note also not to make things too cramped or else the drawing may become unreadable.

For drawings of printed circuit boards, don't use pencil shading to differentiate between copper and board as this will necessitate a half tone block which is more expensive to produce than a line block. A simple way to produce shading is to find any rough, pebbled surface like vinyl cloth and place black carbon paper face side up on top of it. Place tracing face down to this and rub gently with smooth end of pen or stock, the raised portions of the vinyl will transfer carbon where it is wanted. Having done this, to prevent the carbon smudging a light spray from the XYL's hair lacquer can (colourless variety) will fix it.

Again, for the rich, there is a variety of rub-off tints by "Letraset" and similar makers which give a very nice result. In the drawing of my modified square, both examples are shown, plus a transparent base stick-on shading. This one is good as it is simple to remove any shading that is not necessary simply by scraping with a blade the tint on the surface.

SOANAR CATALOGUE

Soanar Electronics Pty. Ltd have issued their new 1971 components catalogue containing 20 pages of technical specifications of Elna electronic components, including a range of new lines, slide potentiometers, miniature and trim potentiometers, car radio suppressors, Te ceramic discs, and an economy range of tantalum capacitors. Further information from Soanar Electronics Pty. Ltd., 30-32 Lexton Rd., Box Hill, Vic., 3128, or their interstate offices.

FINAL SMOOTHED SUNSPOT NUMBERS

July 1969	105.9
August 1969	105.5
September 1969	105.4
October 1969	104.1
November 1969	104.6
December 1969	104.9
January 1970	105.6
February 1970	106.0
March 1970	106.2
April 1970	106.2
May 1970	105.6
June 1970	105.8

—Commonwealth of Australia, Ionospheric Prediction Service

PROVISIONAL SUNSPOT NUMBERS

JANUARY 1971

Dependent on observations at Zurich Observatory and its stations in Locarno and Arosa.

Day	R	Day	R
1	58	16	68
2	62	17	69
3	62	18	86
4	69	19	86
5	82	20	104
6	82	21	105
7	86	22	100
8	86	23	96
9	74	24	89
10	70	25	82
11	68	26	89
12	75	27	111
13	70	28	99
14	67	29	96
15	61	30	74
		31	76

Mean equals 77.9

Smoothed Mean for July 1971: 103.6.

Predictions of the Smoothed Monthly Sunspot Numbers

February	81	May	75
March	79	June	73
April	77	July	71

—Swiss Federal Observatory, Zurich.

The Wireless Institute of Australia—Federal Executive

REPORT TO FEDERAL COUNCIL (1971)

Gentlemen,

It is my pleasure to present the Report on behalf of the Federal Executive on its activities subsequent to the 1970 Federal Convention. I again follow the practice that I adopted last year of reporting to the time of writing and not to the end of the financial year which ends on the 31st December.

The year under review has been significant in many ways. It was the sixtieth year of the Wireless Institute of Australia and the year that so much of our time has been devoted to preparation for 1971 World Administrative Radio Conference. It is a year that has been marked by considerable activity, significant progress and some real difficulties in relation to our administration. I deal with specific topics under different headings.

● COOK BI-CENTENARY AWARD

This Award has proved to be an outstanding success, far greater than any of us were prepared to hope for. The optional AX call sign was used by practically all Australian Amateur operators, so much so that at least some of us found it hard to get out of the habit at the beginning of 1971. By 6th March, 1971, 1,282 Awards had been issued for the h.f. section and 34 had been issued for the v.h.f. section—a total of 1,300.

Two things made the Award a success. First was the support it received from all those who used the AX prefix and who talked about the Award when on the air. Second was the work of the Federal Awards Manager, Geoff Wilson, VK3AMK. The success of any award is very much dependent on the Certificates being processed and issued as quickly as possible after the application is received. Despite the enormous volume, Geoff has done this magnificently and I cannot speak too highly of what he has done to make this Award one of the most important features of Amateur Radio in recent years.

I think we should all take pride in the fact that nearly every overseas applicant has taken the trouble to enclose a note with his application complimenting the Australian operators for their courtesy and assistance during the Award period.

Nearly a quarter of a million QSL cards—100,000 of which were provided for Australian Amateurs free by the Australian Tourist Commission—have been distributed and have been bedevilling QSL Managers ever since. We were asked to provide even more during the year, but, unfortunately, as only a small number was required this proved to be uneconomic and we were unable to accede to this request.

Quite apart from the Cook Award, many people have expressed a preference for the AX prefix and have suggested that it could be adopted permanently. We certainly were lucky that those particular letters were available in the block allocated to Australia.

● 1971 WORLD ADMINISTRATIVE RADIO CONFERENCE

A very considerable amount of time has been devoted to this very important World Administrative Radio Conference.

A formal submission, published in "Amateur Radio," was presented to the Australian Administration. A second document circulated to all Federal Councillors was subsequently prepared following a lengthy Conference with the Departmenta, representatives under the Chairmanship of Mr E Sandbach, Assistant Director-General, Engineering Services (P.M.G.). The Wireless Institute was represented at these Conferences by the Federal Vice President (David Rankin), the Federal Secretary (Peter Williams) and myself.

Following discussions with representatives of Amateur Societies within Region III, in the course of my visit overseas last year and my discussions with I.A.R.U. Headquarters and Region I. officials, the following policy was adopted by the Region III. and the Region I. Associations:

> "That National Amateur Radio Societies shall seek—
>
> 1. That there shall be no curtailment of existing Amateur allocations, and
> 2. That the Amateur Service shall have the unrestricted right to use its allocations for non-terrestrial purposes and techniques subject to Regulation 115 of the Radio Regulations (I.T.U. 1968) where applicable and the provision where appropriate of Space Telecommand facilities (Regulation 34 AY)."

The U.S.A. document forwarded to I.T.U. proposes deletion of the existing Amateur allocation 21 to 22 GHz. and inclusion of the band 24-24.5 GHz. for Amateurs on a secondary basis to radio location.

The Australian proposals provide for the allocation of an exclusive band 24-24.5 GHz. for the Amateur Service to replace 21-22 GHz. Apart from this amendment, the Australian Administration at this time proposes no alteration to the existing Amateur allocations.

In regard to the use of space techniques in the Amateur Service the Australian Administration proposes unrestricted use of such techniques in the bands 7-7.1, 14-14.35, 21-21.45, 28-29.7 and 144-146 MHz, and its use on a "non-interference to" basis from other services in the bands 420-450, 1215-1300, 2300-2450, 3400-3650, 10,000-10,500 MHz.

In addition, the Australian proposals do not propose a flux density limitation.

The U.S.A. has submitted a paper to the C.C.I.R. Study Group for the period 1970-1971 proposing a draft recommendation in relation to the technical feasibility of frequency sharing in the Amateur Radio Service when using space communication techniques. This document was based on papers prepared by the Radio Amateur Satellite Corporation (A.M.S.A.T.). The Australian Post Office requested that the Wireless Institute prepare similar documents and, accordingly, the Federal Vice-President (David Rankin) and George Pither (a member of the Federal Executive) prepared a draft report and recommendation dealing with the same questions. These documents were adopted without any change by the Australian Administration and will be presented to the special joint meeting by the Commonwealth of Australia.

There is no doubt that to date the Australian Amateur position has been satisfactorily preserved. The area of real difficulty would appear to be in relation to the shared bands where some countries are reluctant to permit the Amateur Service the privilege of using these allocations for space techniques. The Federal Council has been kept informed of developments in relation to these matters and has been given copies of all submissions made to the Postmaster-General's Department as well as copies of the table of proposals, the American report and draft recommendation for the C.C.I.R., and the Australian report and draft recommendation for the C.C.I.R.

The pressures on Amateur frequencies in the v.h.f. area remain intense. Whilst I have reported in some detail on the results to date in relation to the 1971 Space Conference for obvious reasons, I prefer not to offer further comment on this matter. The matter will necessarily be discussed by the Federal Council at the Federal Convention when the Institute's policy will be reviewed in the light of the events which have occurred.

● OVERSEAS VISITS

In June of 1970 I had the opportunity to go to Tokyo for the purposes of my business. I was asked by the Federal Council to extend this journey to a round world ticket. As the additional expense was not all that great, $600 from the I.T.U. fund was, by resolution of the Federal Council, made available for this purpose; $200 was expended by "Amateur Radio" and $300 was provided by the Region III. Association.

It is perhaps appropriate that I should summarise the places I visited.

First, I went to Manilla, Philippines, and saw representatives of P.A.R.A. and P.A.R.S.

Then, in Hong Kong I met representatives of H.A.R.T.S. This Society, an I.A.R.U. Member Society, was invited to become a member of the Region III. Association and its application for membership has recently been circulated to all Directors and accepted.

In Tokyo I met the President of J.A.R.L. as well as its Overseas Liaison Officer, K. Mizoguchi (JA1BK) and J.A.R.L. Third Division officers entertained me when I visited JA0KPO at Expo '70. In San Francisco I met Doc Gmelin, the Pacific Division Director of A.R.R.L., and in Des Moines, Iowa, I spent a couple of days at the home of W0DX, Bob Denniston, A.R.R.L. and I.A.R.U. President. Bob took me to Washington, D.C., where I met Dr Perry Klein, Jan King, Bob Booth, Prose Walker and many other prominent Amateurs at a meeting of A.M.S.A.T. I expressed the appreciation of W.I.A. for all that A.M.S.A.T. had done in relation to the launch of AO8.

I attended a State Convention at Jackson Mills, West Virginia, and, still accompanied by Bob, I went to A.R.R.L. Headquarters in Newington, Connecticut, where I met and conferred with John Huntoon, Dick Baldwin and other A.R.R.L. officers.

In London, I met Roy Stevens (G2BVN), a member of the R.S.G.B. Council, and the Secretary of the I.A.R.U. Region I. Association. At the Headquarters of R.S.G.B. in Doughty Street I talked with Ron Vaughan, the Manager of R.S.G.B., and I was asked to visit the leader of the United Kingdom Delegation to the 1971 W.A.R.C., Mr. Don Baptiste. This I did, accompanied by Roy Stevens, and we had a most fruitful and enlightening discussion with Mr. Baptiste.

In Copenhagen I met Vogg Jacobsen (OZ-1DX), the Secretary of E.D.R., and in Paris I met and conferred with the President of R.E.F., Andre Jacob (F3FA), and the paid Secretary of R.E.F., Claude Lauderau. During four days in Geneva a great deal of time was spent with the Secretary of the International Amateur Radio Club, Ted Robinson (F9RU). I also asked to see M. M. Milli, the Secretary-General of the I.T.U.

New Delhi came next, where I met representatives of the Amateur Radio Society of India as well as other Amateurs. A.R.S.I. has now applied for and has become a member of the Region III. Association.

In Bangkok I met and conferred with representatives of the Society of Thai Amateur Radio, including Fred Laun and Don Rieboff. This Society has now applied for I.A.R.U. membership and conditional on that being granted, has applied for membership of the Region III. Association. They gave me the necessary documents and asked me to transmit them to I.A.R.U. Headquarters.

In Kuala Lumpur members of the Council of M.A.R.T.S. met me and in Singapore I was entertained by representatives of S.A.R.T.S. This Society also gave me the documents applying for membership of I.A.R.U. and, conditional upon that membership being granted, it has applied for membership to the Region III. Association.

Throughout my journey I recorded a detailed commentary which I sent back to John Battrick (VK3OR). These were typed up by John and circulated to Federal Council. In all, these reports amounted to twenty-three pages of closely typed foolscap.

I should like to record my deep appreciation of the enormous effort expended by John in ensuring that these reports became available to Federal Councillors and, through them, to Divisional Councils as quickly as possible.

After my return, I submitted a twenty-two page final report to the Federal Councillors for their consideration, making certain recommendations and recording certain observations.

Everywhere I went I was met with courtesy and understanding. I received, and I hope the Federal Council through my reports, has received an enormously valuable insight into the workings of Amateur Radio world-wide. I certainly came away with a far clearer understanding of the problems that beset I.A.R.U., particularly at its Headquarters in America and at the Region I. level in London. I believe also that this liaison with other Societies has contributed greatly to the favourable position that we appear to have achieved in relation to the 1971 W.A.R.C. Naturally, I find it difficult to comment on this journey undertaken on your behalf; however, it is for the Federal Council to decide whether or not this journey and the information acquired was worthwhile and, therefore, justified the expense.

● I.A.R.U. REGION III. ASSOCIATION

During the past year a considerable volume of correspondence has taken place between your Director, John Battrick (VK3OR), the Secretariat and other Societies.

I will leave it to John to report in detail on this aspect of the Institute's activities, but I

would like to offer certain comments in this report from the Federal Executive. The adoption of a Regional policy for 1971 Space Conference referred to above was, in my view, highly significant and an illustration of the important need that this Association can fulfil. The Conference of the Association to be held in Tokyo in the middle of March 1971 (in a few days' time, as I write) will mark the turning point in the affairs of this Association.

With great regret the Federal Council noted that John Battrick would not be able to attend this Conference as originally decided because of his work commitments. Accordingly, the Institute will be represented by George Pither (VK3VX., who will be in Tokyo as part of a personal tour of South East Asia, and myself. As George will still be overseas at Easter, it will fall to me to report in detail (I hope in writing) to the Federal Convention.

Unfortunately, this Conference is to some extent overshadowed by a dispute between the two Societies in the Philippines. The Secretariat, in formulating its Interim Constitution, accepted the assurance of one Society that it would replace the existing I.A.R.U. Society as a member of I.A.R.U. This has not occurred and now both Societies claim membership of the Region III. Association. It will, therefore, fall to the Conference to decide as a matter of basic policy whether the Association will look behind the I.A.R.U. membership of any Society.

It would indeed be tragic if this sort of issue —important though it is in terms of basic philosophy—was allowed to divert attention from the more tangible areas to which we must look for progress. I believe that the Institute must look to a clear decision from this Conference as to the future activities of the Region III Association. From a cautious start in 1968 we must, I believe, now look for a determined, realistic, tangible programme for the future.

In considering the W.I.A's role in the Region III. Association, we must face the fact that the Institute has far too many calls on its limited resources. There must be some limit to what 4,500 members can afford. The financial load for the Region III. Association accepted by the Institute over the past three years is, on a per head basis, far higher than any other Society contributing to Region III. funds. I do not believe that this situation should continue. The cost of bringing together representatives from the different Societies in the Region is enormous and can only be justified if the Association is vital and useful in developing and protecting our hobby in the Region. If the Conferences are negative in their approach, if the valuable time of a Conference is devoted to the discussion of form rather than substance, then I believe that the Institute must be more cautious as to the extent of its resource that it is prepared to commit to this area.

I cannot stress too much how important this Conference will be.

● LIAISON—AUSTRALIAN POST OFFICE

I have already referred in some detail to our discussions with the Postmaster-General's Department in relation to the World Administrative Radio Conference. In addition to that matter, the Federal Executive has discussed with the Postmaster-General's Department the contract for the continued publication of the Call Book and numerous other matters which I do not detail.

Two more significant matters do, however, deserve specific reference.

Early in 1970 the Federal Executive made strong representations to the P.M.G. Dept. for the restoration of the segment 7.15–7.3 MHz on a shared basis. This representation has been sympathetically received by the Department and we believe it is now consulting with adjoining Administrations to determine whether this is feasible. I certainly hope that this application is ultimately successful, for it would result, for a change, in the Amateur Service gaining frequencies. The Australian allocation would then match the Region II. allocation and will enable cross-Pacific phone communication with American Amateur stations.

The Federal Executive has also sought the repeal of Regulation 58 (2) and an amendment to Paragraph 54 of the Handbook to recognise this repeal. This Regulation requires the licensee of an Amateur station to have appropriate frequency measuring equipment capable of verifying that his emissions are within authorised Amateur bands. (Note.—This has been achieved.)

The Institute has always taken the view that the requirement that a station operates within a band is absolute and that this further requirement involving a value judgment as to what is appropriate equipment or not merely causes disputes and difficulties.

I understand the Department agrees with this view and will be making the appropriate alterations to its Forms and the Handbook and seeking a repeal of the relevant Regulations.

No discussion of our relationships with the P.M.G. Dept would be complete without reference to the most courteous and helpful assistance the Federal Executive has received from the officers responsible for the administration of the Amateur Service. These officers, with a multitude of responsibilities, somehow find time to always have their doors open to the W.I.A. In particular I would wish to acknowledge the assistance the Federal Executive has received from Mr. Jim Wilkinson, the Assistant Director-General, Radio, Mr. H. Young, Controller Licensing and Regulatory Sub-Section, and Mr. Eddie Sandbach, the Chairman of the Committee concerned with the preparation of the Australian Proposals for 1971 Space Conference. To these officers, for their understanding, co-operation and completely fair approach, I express our heartfelt thanks.

● ADMINISTRATION

In my last Report to the Federal Convention I referred to the enormous work-load imposed on the Federal Executive. This has persisted throughout the present year.

The problem of finding people able and willing to undertake tasks of this nature became apparent during 1970 when Ken Pincott, the Editor of "Amateur Radio", indicated his wish to resign. It rapidly became apparent that Ken could not be replaced by a part-time volunteer and, accordingly, the Councils of the New South Wales Division and the Victorian Division met in October to jointly discuss the problem. A representative of the Federal Executive—the Federal Secretary—was present at that joint meeting by invitation of both Divisions. That joint meeting recognised that it was impractical for any one Division to publish "Amateur Radio" by wholly honorary staff and also recognised that it was impractical for Federal Executive to operate effectively with only honorary staff. It acknowledged that there was no alternative to the employment of a paid Manager to undertake these tasks. Both Divisions resolved to support financially a move for the employment of a paid Manager and urged other Divisions to participate.

A Joint Committee was set up, consisting of representatives of the Federal Executive (the Federal Secretary and myself), representatives of the Victorian Division (Dr. Deane Blackman and Keith Roget), and the President of the N.S.W. Division (Don Miller).

Concurrent with the investigation into the employment of a paid Manager, Dr. Deane Blackman continued an examination of the feasibility of committing to an electronic data processing system the mechanical processes presently inherent in the administration of the Institute, particularly with regard to the production of subscription notices, the collection of subscriptions and such matters as address changes.

In early January an advertisement was published in the Melbourne "Age" and the Sydney "Morning Herald" seeking applications for the job of paid Manager of the Institute. The same advertisement was published in the January issue of "Amateur Radio". At the same time, other Divisions were informed of the steps being taken and ultimately all Divisions have now indicated their preparedness to contribute on the basis proposed by the Victorian and N.S.W. Divisions.

I stress that the steps that have been taken have been taken outside the formal framework of the Federal body as the most urgent requirement was for paid assistance to produce the magazine for its present publisher, the Victorian Division. The matter has, however, now been formally referred to the Federal Council by postal vote and, I believe, all Divisions are supporting the moves that have been taken.

Mr. Peter B. Dodd, VK5/5/3/2/1CIF has been appointed as Manager. As such, he will be working from the Victorian Division and for that Division will be assisting with the production of "Amateur Radio". Part of his time will be made available to the Federal Executive and he will also be working as a paid Manager for the Federal body. Mr. Dodd will be attending the Federal Convention and this will provide an opportunity for him to meet representatives of all Divisions. He is an enthusiastic Radio Amateur having been licensed since 1946. He has the administrative experience that qualifies him extremely well for the position.

The total cost of putting the administration of the Federal body and the administration of "Amateur Radio" on a proper basis will be in the region of something approaching $3 per head. For the balance of this year, however, a smaller sum—in all $650 per month—will be borne per capita by all of the Divisions.

The 1971 Federal Convention will discuss in detail the future of the Federal body. It will determine the course the Institute will take following the expiration of the interim arrangements currently in force at the end of the present calendar year.

● NEW FEDERAL COMPANY

It is proposed that the Manager to be employed in the interim by the Victorian Division will be employed by the Federal body after its incorporation and following the transfer of the Institute's publications from the Victorian Division to the Federal body.

All Divisions have now executed the Collateral Agreement that was prepared as part of the incorporation of the Federal body. Unfortunately, whilst the Articles and Memorandum of Association have been executed by the Victorian Division, the originals of these Documents have gone astray in circulation. Intensive enquiries have indicated that only one document—the Collateral Agreement—was received by the Queensland Division though both documents were forwarded to the New South Wales Division. A further copy of the Memorandum and Articles of Association have now been prepared and have been circulated amongst the Divisions for execution.

The incorporation of the Federal body will solve many of the accounting and other problems that are created by the present interim arrangements.

As I have pointed out above, the pressure on the Federal Executive over the past year has been intense. The 1971 Space Conference has produced a great deal of additional work as has the general review of the Institute's administration—the latter amounting to a continuing crisis lasting over many months.

A great deal of the work has ultimately and necessarily devolved on the Federal Secretary. A series of choices has had to be made as to priorities, some work having to be shelved for some time in favour of more urgent work. An example (small in itself) is that the reply of the Minister to the Federal Executive's submission in relation to licence fees was published (a fortnight after it was received) in "Amateur Radio" without first having been circulated to Federal Council.

Certainly this must be irritating to Federal Council and certainly it is not the way these things should be done. There was a long gap in the production of Minutes of Federal Executive meetings. This has now been rectified. The matter has been further aggravated by the inadequacy of the paid administrative resource available to the Federal Executive to type and duplicate correspondence and memoranda. An example of this is the fact that the very important memorandum relating to the appointment of a paid Manager took no less than fourteen days to type in the office even though it was put on tape during the actual Committee's working time over the long week-end at the end of January. A covering letter taped at the same time, was not available for a further few days. This is not to imply any criticism of the Victorian Division's paid staff. In the case mentioned, intervening illness was the basic cause for the delay. At other times more urgent work has just had to take priority. Nor do I apologise on behalf of any officer of the Federal Executive. There must be times when work and family commitments must be given if not priority at least some attention. The situation illustrates the hopeless inadequacy of our continuing to rely on a total volunteer work-force, supported by an inadequate paid staff to which, in any event, we have limited access because of limited funds. I believe that we have now found the solution in the engagement of Peter Dodd.

In the present context I have simply pointed to the situation that has existed over the past months as I am sure that Federal Councillors will appreciate the situation and will see these matters in their proper perspective.

● I.T.U. FUND

The following amounts were to be contributed by each of the Divisions to establish this Fund—

New South Wales Division	$2,000
Victorian Division	1,000
Queensland Division	880
South Australian Division	1,120
Western Australian Division	480
Tasmanian Division	400
	$7,000

At this time a total of $6,438 is held in the Fund, with all Divisions except the N.S.W. Division having attained their quota. The balance has been depleted by $500 contributed to the cost of my overseas travel referred to above. The N.S.W. Division has paid to the Federal Executive $1,438.

■ MEMBERSHIP

In the last Report of Federal Executive a table, based on membership figures to 30th December, 1968, was published. Herewith is a table up-dating those figures to 30th December, 1970—

Membership as at 31st December, 1970
(1969 figures in brackets)

	Total Licensees	Full Memb.	% Memb. as against Total Licensees	Assoc Memb.	Total Memb.
VK1	1972 (1933)	1106 (1061)	56% (55%)	430 (400)	1536
VK3	1968 (1838)	1035 (930)	53% (50%)	214 (276)	1220
VK4	817 (694)	398 (360)	48% (51%)	127 (140)	525
VK5	803 (748)	348 (418)	43% (55%)	299 (240)	647
VK6	497 (462)	295 (283)	59% (61%)	91 (86)	386
VK7	232 (229)	134 (142)	58% (64%)	50 (114)	304
Totals	6289	3322	52% (54%)	1211	4533

Notes.—VK1 included with VK2.
VK6 included with VK5.
VK9 included with VK4.
13 VK0s (column 1) excluded.

The movement since last year is interesting. Both the New South Wales and Victorian Divisions have improved their positions, whilst the smaller Divisions appear to have lost ground—apparently failing to keep up with the increasing number of licensees. It is very disappointing that our overall position (licensees as against members) has dropped by 2%

● "AMATEUR RADIO"

No report of the Federal Executive would be complete without reference to the work of Ken Pincott, the Editor of "Amateur Radio". Ken has retained that position throughout the whole of the period even though under enormous pressure at work and at home. The magazine has continued to maintain a high standard and I am sure that I speak on behalf of all Australian Amateurs when I say to Ken simply and sincerely "thank-you".

● AUSTRALIS

At the 1970 Federal Convention the Federal Council resolved to support the A.O.B. Project.

The total cost of the production of the space hardware involved in this project was envisaged at some $5,000, but current estimates put the figure nearer $3,000 with some two-thirds of this having been expended or committed.

I do not in this report propose to deal in detail with matters relating to Australis for the Group will report separately and fully on its activities. There are, however, two matters upon which I would wish to comment.

The Federal Executive was very conscious of the lack of information circulated to Divisions and members generally as to the progress of the Project during the second half of 1970. The Group faced an almost impossible schedule to prepare its hardware for shipment to the United States of America, and it was impossible for the Group to devote time to any other activity than this.

Richard Tonkin, who previously held the dual post of Oscar Co-ordinator and Chairman of the Project Australis Group, stepped down as Oscar Co-ordinator and the Federal Executive appointed Mr John Battrick (VK3OR) as Oscar Co-ordinator. These decisions were made at the request of the Group, and John has already been able to lighten the work load on the other members of the Group and also ensure that more information is circulated to Divisions and to members generally.

● "HAMS WIDE WORLD"

During my visit to the A.R.R.L. Headquarters in Newington, Connecticut, I saw the A.R.R.L. film, "Hams Wide World". This film lasts 27½ minutes and is an attempt to tell those who know nothing about it a little of the hobby of Amateur Radio. It is, of course, orientated very much to the American environment and stress is placed on certain aspects of the hobby—such as third-party traffic—that are foreign to our hobby in this country.

The A.R.R.L. has offered to make available to the W.I.A. a print of the film. It will cost not more than about $300 and is in 16 mm. colour. No doubt the Federal Council will care to consider whether or not they wish to authorise the purchase of the film with a view to its being circulated amongst the Divisions.

● V.H.F./U.H.F. PROGRESS

Once again the past year has seen further improvements in the distances covered in the u.h.f. bands. The 432 MHz. record was increased to 482 miles by AX5ZKR of Yahl, near Mt. Gambier, working into AX7ZRO/7 on Mt. Wellington, near Hobart. Bass Strait was also spanned a number of times on 1296 MHz., with the best contact claimed to date being between VK3AKC at Geelong and VK7ZAH at Launceston. The distance claimed is 274 miles and at the time of writing is subject to check.

No distance records were claimed on the v.h.f. bands, but the propagation conditions made the 52-54 MHz. band particularly interesting with the advent of some International DX such as C21, HL, JA, KH6, KR6 and W8.

● MISCELLANEOUS MATTERS

I deal briefly with a number of miscellaneous matters.

Committee to Assist Federal Executive: Following the 1969 Convention the Federal Executive referred to a Committee from the N.S.W. Division the question of specifications of standards for solid state television receivers sold in Australia with a view to the adoption of standards to determine the minimum susceptibility to cross-modulation. This report has still not yet been received.

Novice: In addition, following the 1970 Convention the N.S.W. Division was asked to provide a committee to formulate a report on Novice Licensing to assist the Federal Council to determine its attitude in relation to this contentious matter. Mr. Rex Black has been appointed Chairman of that Committee and I am aware that he has devoted a considerable amount of time to the matter. It may well be that a report will be available for the Convention.

Custom Duty and Sales Tax: During the year in question, the Customs Department allowed the admission into Australia of a transceiver on a by-law entry basis. Whilst this does not set a precedent for the future, information relating to this matter has been circulated to Federal Councillors and the information has been also placed in the hands of the Australian Agents of the manufacturer of the equipment in question. The Federal Executive does not see this as a relaxation of the long-standing policy of the Customs Department to impose a high tariff in this area. The Federal Executive believes, however, that a strong case can be made for the reduction of these extremely high duties and taxes. The matter will continue to receive the attention of the Federal Executive in the year about to commence.

Ties: Following a decision of the Federal Council at the last Federal Convention, designs for an Institute tie were obtained and they were circulated to the Divisions. Generally speaking, the response to this project has been disappointing, but a limited number of ties will be available in a few months time, though, because of the limited interest, the cost per tie will be considerably higher than originally expected.

"How to Become a Radio Amateur": Proofs of this brochure have been submitted to the Postmaster-General's Department and a number of amendments incorporated. The Divisions were asked to indicate the basis upon which this was to be funded. A considerable delay occurred before replies were obtained. Again a limited number of the publication will be available in the near future.

● FEDERAL EXECUTIVE

Between Easter 1970 and 6th March, 1971, the Federal Executive held twelve meetings. The attendance at meetings was as follows—

M. Owen	10
P. Williams	12
D. Rankin	12
G. Pither	8
D. Wardlaw	10
W. Roper	9
K. Pincott	8

● KNOWING MORE ABOUT AMATEUR RADIO

In the "World of Amateur Radio" column conducted by Pat Hawker (G3VA) published in the November issue of "Wireless World" the following appears—

> "With over half the world's Radio Amateurs in America, trends there play a major role in determining the future of the hobby. Over the past twenty years the total of U.S. Amateurs has more than trebled from 85,682 in 1950 to over 288,000; but recent years has seen a marked slowing down (and even a reversal in some years) of this growth accompanied by a re-distribution of age groups. Many of the more active stations are those belonging to 'senior citizens' and to teenage newcomers with a sharp falling off of the twenty to forty age group—'those young enough to be enthusiastic but old enough to be doing something interesting and productive with it' to quote a recent article by John Frye on the future of Amateur Radio in 'Electronics World'.
>
> "While this trend is far less noticeable in Europe there is some evidence of a weighting towards the upper age groups . . . . (Frye) believes that the apparent slackening of interest in the constructional and technical aspects of the hobby could be overcome by placing more emphasis on what Amateur Radio has to offer in the way of challenge to the intelligence and skill, in world-wide comradeship and in the diversity of Amateur activities."

The Federal Executive has discussed this and other comments following a similar line of thought. "What is the future of Amateur Radio" seems to be a question that is now very timely and one that could well be considered by the Federal Council. Of course, the situation in America may not be indicative of the situation world-wide. America has one Amateur per 900 of population, but, for example, there is in Australia one in 2,000 of population. Perhaps all that the American experience shows is that there is "a saturation point" in the number of Amateurs that one can expect in one community. A comparison between the U.S. Call Book for Summer 1970 with that for Spring of 1968 shows a drop in U.S. licensees of 1.9% as against a 12% increase for Australia and a 25% increase in the world figure excluding the United States figures. The fall in American licences is due in part to the introduction of charges for licences and to changes in the system. Licences which were free until about 1967 now cost $5. This means that many inactive Amateurs did not renew their licences.

I would suggest, however, that these figures are not a justification for complacency. They tell us nothing of the quality of the Amateur Service. Making the Amateur Service more attractive, as Mr Hawker suggests, does in fact achieve two things. It may attract more Amateurs and at the same time it may improve the Amateur Service's case for justifying its own continued existence. The question of age distribution raises a very interesting issue. Our problem in Australia is that we know very little of the patterns that exist. There is in my mind no doubt that we could know a great deal more about our hobby. Given more facts I believe that we could better plan for the future. I commend this matter for the consideration of the Federal Council.

● CONCLUSION

I am conscious that this report is unreasonably long; despite this, it deals only briefly with a number of important topics and does not deal at all with a number of others.

The topics I have dealt with in detail are, I hope, of interest to all our members.

Finally, I would like to pay a tribute to those many people who have made the past year the success that I believe it has been. Firstly, to all the Federal Councillors I express the Federal Executive's sincere thanks. Without their support and understanding we would have been, on many occasions, lost. I would also like to record my deep appreciation of the work of all the co-opted Federal officers, particularly the Awards Manager (Geoff Wilson, VK3AMK) and the Contest Manager (Neil Penfold, VK6ZDK) and the various other officers who have given so unstintingly of their time.

I find it hard to express in words my feelings to the members of the Federal Executive. Once again, I have relied time and time again on the wisdom and good sense of David Rankin, the Federal Vice-President. Peter Williams has devoted an enormous amount of time in carrying out his role of Federal Secretary. It is beyond me to detail the enormous and unremitting workload that this post has involved. Despite very real personal difficulties, Bill Roper has provided almost invaluable assistance as Federal Treasurer, a position of ever-growing importance.

I believe that the Federal Executive is an able and efficient team, bringing together a breadth of experience and knowledge that would be hard to equal in any organisation. I have been privileged to be a member of that team.

As we enter the new year, following the 1971 Federal Convention, I believe we can look to the future with confidence. The almost universal support that we have found—recognising the need to employ top level staff to

guarantee the continued existence of the magazine and of the Federal body, and the consequent need for an increase in fees—has been, if not surprising, at least highly gratifying.

There is, of course, much work to be done but that work will become much easier in the knowledge that our organisation is moving into a new era.

—Michael J. Owen, VK3KI,
6/3/71. Federal President.

W.I.A.—FEDERAL EXECUTIVE

BALANCE SHEET
as at 31st December, 1970

1969		1970
	Accumulated Funds:	
	Balance, 1st January, 1970	$3674
	Less Deficit	279
$3674		$3395
	Represented by:	
	Current Assets:	
$187	Commonwealth Trading Bank Federal Executive	$1632
561	Publications	773
1455	Sundry Debtors	—
536	Stock on hand	—
$2739		$2410
	Fixed Assets:	
1223	Furniture, Fittings and Equipment, at cost less depreciation	1109
$3961		$3519
	Less—	
	Current Liabilities:	
$752	Reserve Fund	$752
—	Deposits in advance	372
835	Sundry Creditors	—
		1124
$3674		$2395

AUDITORS' REPORT

We have examined the books and vouchers of the Wireless Institute of Australia (Federal Executive) for the year ended 31st December, 1970. In our opinion the accompanying Balance Sheet is properly drawn up so as to give a true and fair view of the state of the Affairs of the Federal Executive as at 31st December, 1970, and the attached Statement of Income and Expenditure is properly drawn up so as to give a true and fair view of the results for the year ended 31st December, 1970.

Melbourne, 18th March, 1971. Hebard & Gunning, Public Accountants.

W.I.A.—FEDERAL EXECUTIVE

STATEMENT OF INCOME & EXPENDITURE
for Year ended 31st December, 1970

1969		
	Income:	
$61	Interest received	$34
1223	State Contributions—Per Capita	2414
527	Publications, etc.	360
—	Australis	1339
1641	Cook Bi-Centenary QSL Cards	—
$3452		$4047
	Expenditure:	
$72	Audit & Accountancy Fees	$38
145	Australis Project	1450
—	Awards	211
3	Bank Charges	7
1669	Cook Bi-Centenary QSL Cards	—
7	Contest Committee	85
—	Call Books, P.M.G.	100
	Convention Expenses, F.E.	335
182	Depreciation	149
330	General Expenses	310
—	Intruder Watch Expenses	9
45	Insurance	41
26	Maintenance Equipment	28
20	QSL Bureau	33
	Region III. Expenses	3
	Secretary's Honorarium	200
707	Travelling Expenses	206
1	SWL Awards	2
12	Subscriptions	15
381	Stationery, Telephone, Postage	448
892	Salaries	675
		4326
$4292		
$840	Deficit for Year	$279

"WIND OF CHANGE"

Brief Report on 25th Federal Convention held in Brisbane, Easter 1971

Yes, there is a wind of change blowing through the W.I.A. This evidenced itself in this Convention in many ways. There were changes in the methods of administration and in the thinking of the Delegates. This is the first Convention with a paid Secretary/Manager. For the first time Delegates had received the Annual Reports and Agenda Items well in advance, thus enabling them to study the numerous documents and discuss the contents from a well informed basis, not only with their Divisions in advance but also round the conference table.

Another innovation was that of the Working Groups concept. This is well known in other fields and materially assisted in the expeditious despatch of contentious business. Furthermore, the Host Division themselves provided observers for each Federal Councillor who could not bring up a member of his own Division. This action greatly eased the work-loads of these Delegates and was the subject of great appreciation. These arrangements enabled the chairman to proceed on a rather less formal basis without dispensing with essential discipline. As a result, far more views were exchanged among Delegates at all levels, both inside and outside the conference hall.

There were eight formal conference sessions totalling 31 hours' work. The Working Groups included in one way or another most of the Delegates, most of the Observers and all of the Federal Executive officers. On each of the four nights of the conference, very few rolled into bed before the early hours of the morning since the Working Groups had no other time available in which to conduct their research, deliberations and recommendations. One of the Observers had even travelled down from far away Townsville and will take back with him a comprehensive knowledge of current W.I.A. affairs at the national level. In total, the conference considered 45 agenda items and 15 reports. As a matter of interest, contests and awards this year occupied a very minor proportion of the time. Notwithstanding the huge volume of work, not every aspect of Amateur Radio required discussion.

Project Australis received the most searching and prolonged debate and discussion in and out of the conference hall. John Battrick, the Federal Oscar Co-ordinator, stood up well to the barrage of questions and recriminations despite having taken this onerous task over only a matter of weeks prior to the conference. He produced the actual demonstrator model which was still "cosmic-ray" filled, having just been recovered after the Hi-Ball balloon flight from Mildura. Much interest was shown in this equipment and it is anticipated that in the next few months all Divisions will have it on short loan for members' examination.

John also displayed the printed board and multi-module chassis which is designed to incorporate multi-channel translators and telemetry. He explained that the designs and construction are in accord with the current state of the art. He went on to say that the recent articles in "A.R." by Les Jenkins, VK3ZBJ, and Harold Hepburn, VK3AFQ, showed the way in which Amateurs can get on this "band waggon". John brought everybody up to date and answered, to the best of his ability, a barrage of questions on all aspects of the Project. One reaction, among many enthusiastic responses, was the immediate donation of a sum of money to aid the Project. Judging by the reactions, there is now every prospect that AO6 will achieve success.

Once again much time was devoted to consideration of measures aimed at the protection of our frequencies and their usage. I.A.R.U. Region III. Association Reports on the conference in Tokyo last month, at which the W.I.A. was represented by the Federal President and Air-Commodore George Pither, VK3VX (at his own expense), highlighted our problems. In July there is the World Radio Administration Conference of the I.T.U. in Geneva, and the Tokyo I.A.R.U. Conference decided it was desirable to send a Region III. Observer to Geneva. This will be paid for out of Region III. funds and the person selected, Tom Clarkson, ZL2AZ, appears to be ideal for this task.

On the question of frequencies, another aspect was deeply discussed, namely, the report on "Novice" licensing by the committee under the chairmanship of Mr. Rex Black, VK2YA, as appointed by Federal Executive. Motions on this matter were debated and adopted. Another aspect is Repeaters which arose from the very interesting report from the Repeater Secretariat.

On contests, the management now moves from VK6 to VK4 and will be under the able direction of keen organisers in Brisbane. Time precludes further comment at this stage, but the "winds of change" are more than a breeze

☆

RECOVERY OF STOLEN VK2 INSTITUTE PROPERTY

During February 1971, Sydney police recovered the majority of the communications equipment that was stolen during October and November 1969 from the Institute stations VK2WI (Dural) and VK2AWI (Atchison St.). So far none of the publications or store items (resistors, semiconductors, etc.) have been located. It is understood that they also recovered a lot of electronic and other items which had been stolen from around Sydney. The police have charged a person in connection with this offence.

DX

Sub-Editor: DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

Due to the industrial trouble in the British Post Office, and complete lack of information from the VK chaps, there was no possibility of compiling any news last month. The situation has now returned to normal and the news sheets are flowing once more. I would appreciate some more news from our members, our supply of news from overseas is on a reciprocal basis and if I can't supply them, they won't assist us.

I would like to correct a possible error in the March issue, or at least one VK6 chap considers it an error. I refer to the comment which I made in reference to Jock ZL3QX accepting "a 25c mint stamp in lieu of the IRCs" for awards issued by the N.Z.A.R.T. My correspondent has altered the context and accused me of saying that he will accept a 25c stamp in lieu of AN IRC. I refute this statement, it did not appear in print either directly or by implication, but to clear myself of any adverse comments which may have arisen through what was a grammatically bad sentence, I will re-phrase the statement. Most N.Z.A.R.T. awards cost 3 IRCs, however the Awards Manager of that Society, Mr. Jock White, will accept a 25c mint Australian stamp in full payment for the award. To put this in simple arithmatic, 3 IRCs at 18c each cost 54c, a stamp costs 25 cents, thus the saving per award is 29 cents or over 50 per cent. of the cost.

QSL information for 9G1QT and FJ7JC relating to current operation is required by Noel VK2AHH, at Box 137, Kempsey, if anybody can assist.

Had a note from Ray Kearney back in December in reference to the operation from Mawson by VK0CC, who was due to come on from that locality early this year. I included this in an earlier batch of notes which missed the deadline, so for the benefit of all concerned, please send QSLs for this operation, which is by Col VK2BCC, to Ray Kearney, VK2BRK, 13 Kiora St., Canley Vale, 2166.

Pleased to note that Jack VK3AXQ is back on the air again from new QTH in Hawthorn. Amongst stations worked by him are VK9YR on Cocos, KC4USI on the C.G. Icebreaker "Staten Is", MP4TDU, Kev Straw, Hdq. B.T.E., R.A.F. Sharjah, Trucial, Oman, XW8DO, Box 25 Vientianne, plus many others.

I have in front of me all the 1971 issues of Geoff Watts DX News-sheet, some of which were issued before the strike, but were held up in England. Some of the information given may be a little out of date, but possibly somebody is wanting it as it probably hasn't been seen in print as yet.

A2CAW has been on the air regularly, more often than not on 14230 s.s.b., and usually around 1700z. His address is Private Bag 31, Francistown.

From Nauru we still have Bob Lear pounding in, also C21GB, who is D. G. Stephens, Radio Station MQ1, Nauru Is., Central Pacific. Bob is well known as VK2ASZ, and will be on the island for several years.

CE3AE has been reported here in Sydney quite often of late and is active on 7038, 3510 c.w., and 14333, 21360 and 28560 s.s.b. QSLs to WA3HUP.

DM4WOA, who is Gunther Kochnke, 2344 Glowe/Rg, Ruegan Radio, DDR/German Democratic Rep., is situated on Rugen Is., which counts as EU-37 for IOTA chasers.

W3HNK denies that he is manager for UA9VH/JT1, but if necessary can act as intermediatory for overdue QSLs, as he is in regular contact with the real manager, UA9VE.

King Hussein, who caused many pile-ups last year when signing JY1, was active in January using the call sign G3ATM. In early March, JY1B was operating on 21360 s.s.b.

Activity from Canton Is. by K3QOS/KB6 14225 at 0600z and 1500-1700z, with QSLs going to his home QTH, also K6AZD/KB6 who says he will be there until the end of the year.

Some news from U.S.S.R. UA9TO is in zone 18, UV0EX and UW0IN are in zone 19, whilst UA9YT Vlad Maymiston, Box 80, Kyzyl, Tuvinian, A.S.S.R., U.S.S.R., is in zone 23.

From the Antarctic area we have VP8LN operating from Halley Bay, scheduled to QSY to South Georgia in February, with QSLs to British Antarctic Survey Office, Port Stanley, Falkland Is. 3Y3CC Audun is on from the Antarctic, QSL to LA3CC; 8J1RL from Showa Base, Antarctica, QSL to J.A.R.L., both calls being good for prefix hunters only. VP8KD Frank, QTH not given, QSL to W2FBA, and VP8MC whose QSLs go to WA8EIR.

Two new call sign allocations of interest. 3DA to 3DM have been allocated to the Kingdom of Swaziland, and 3EA to 3FZ have been allocated by I.T.U. to the Republic of Panama.

VU7US is due to commence from the Laccadives on April 10. There is some confusion here. Geoff Watts states the call will be VU7US, whilst the Long Is. bulletin, which is only a couple of weeks old, says the call is VU7US. Take your pick, but whatever the call, there will be little difficulty in locating him. VU5KV will probably be activated in June and like the April one, it will be a multi-operator effort.

The operations by VE3EWY to VP2DAJ and VP2MRK earlier this year have been completed, and Bob asks for all QSLs to be sent to his home address.

The SZ0 prefix currently being used by the Greek fraternity, is a special one commemorating the 150th anniversary of the Greek Revolution, and will be available for the full period of 1971. SZ0CB has been active on 20 MHz.

I don't know the reason, but KW6 seems to be a hard island to get a QSL from. KW6AA is putting a tremendous signal in here and says QSL to WB6YCT. Other Pacific Islands currently active include KC6WS, Bill Sedore, Box 185, Yap, West Carolines. W1ARF/KS6 on Swan Is. QSL to WA6MWG, WB6MQV/KJ6 on Johnston Is., QSL to WB6HDG, VK3PH in the Bismark Archipelago for a year has W9KHI as manager; VK9XX on Christmas Is.; VK9LV is Louis Varney, Box 900, Pt. Moresby, Papua.

Further to the activity mentioned from the Laccadives, I neglected to mention that VU3KV was on from there in mid January with operators VU2KV, VU2DI and VU3RM. QSLs at the time were requested to be sent to VU3KV, Box 3031, New Delhi, India, and enclose five IRCs.

Apparently W3HNK was inundated with requests for assistance with JT1 QSLs, for in a later bulletin he is asking the gang to be patient as there will be 10 to 12 weeks delay on a reply. He has to write to the manager of the station.

5T5AD is mentioned in a list of QTHs from VK3AHH, as being Box 100, Nouakschott, Mauratania. Further to this, he skeds JA1KBO 14345 s.s.b. on Sundays at 0730, with the suggestion to check 21250 at 0900z Sundays. He is using a KWM2 and beam.

XV5HH Howard, says he is ex-CP1GN and QSL to George W3JT, but for what it is worth, George says that he has never heard of him, so looks like a query beside this one.

Reunion Is. has quite a bit of interest these past weeks. Michel FR7AF on 14130, Box 367, St. Denis, Francois FR7AG, Box 819, St. Denis; FR7AH, Claude, also Box 819, St. Denis; and FR7AI, Box 4, St. Clotilde, are all fairly active.

KG6SF, KG6SI and KG6SY are all active from the Marianas, with the latter's QSLs going to Box 189, Capitol Hill, Saipan, Mariana Is., 96950.

OA stations can use the prefix OB during 1971 to mark the 150 years of independance. OB3V was most active during the contest week-end, and asks for his QSLs to be sent to W3GFP.

A new list of prefixes for the various PZ call areas has been made available. PZ1 Paramaribo and Surinane, PZ2 Nickerie, PZ3 Coronie, PZ4 Saramacca, PZ5 for reciprocal licences, PZ6 Para, PZ7 Brokopondo, PZ8 Commewijne, PZ9 Marowijne, and PZ0 for special stations.

This concludes the back log of information from Geoff Watts. As well as providing a very fine up to the minute news sheet, Geoff has an arrangement with W6GSV by which he can supply that gentleman's QSL Managers Directory at a very much reduced rate.

For award hunters and the like, here is the current list of Commonwealth countries: AP, AC3, AP, C2, G, GC, GD, GI, GM, GW, MP4B/M/Q and T, VE, VK, and all VK islands, all VPs, VRs, VSs, VUs, YJ, ZB2, ZC4/5B4, ZDs, ZF, ZKs, ZLs, ZM7, ZS6/7/8/9, 4S, 5H, 5N, 5W, 5X, 5Z, 6Y, 7P, 7Q, 8P, 8R, 9G, 9H, 9J, 9L, 9M2/4/6, 9V and 9Y.

The Annual Islands of the Air Contest is well under way for 1971, certificates are awarded to top-scoring station and s.w.l. in each continent, and the world champion station and s.w.l. receive a silver cup and certificate. Full information on this and island numbers from Geoff Watts, 63 Belmore Rd., Norwich, Nor 72-T, enclosing four IRCs for current Island directory.

A few more new prefixes are listed in Monitor. Some may have appeared in these pages before, but for what it's worth, here they are. CW is used regularly by CX stations in contest events (as a prefix not necessarily as a mode), CW3BH, CW4CR, CW9CZ were very active in last year's events. FT0 is the prefix issued to reciprocal licensees in French Guiana, FY0ZO being the first. HS0 was a special station in Thailand, but no details are given. OI08UF was the Scout Jamboree Station in Finland. YO0 was being used as a suffix by YO2 stations in the city of Timisoara, Romania, up to the end of last December to celebrate the 700th anniversary of that city. 4B1AE was a special call sign issued to XE1AE for the CQ Phone Contest last year. 9C0 was used by EP2 stations last year in the same event. During October last year, 9J1 stations were permitted to use the prefix 9J0 to celebrate the 6th anniversary of Zambia.

VE8AP wishes it known that he has QSLs available for the 1968/9 Pacific Expedition for the calls below, so if you failed to receive a card, an IRC to 1933-22nd Ave., S.W., Calgary Alta, Canada, will do the trick. VR2FR, 5W1AE, VR1P, VE8AJT/KB6 and VR8AE. This expedition was held between Sept. 1968 and Feb 1969.

The following are listed as future operations by the Long Is. DX Association. JD1ABX, ABS and AAZ, who were active at the time of writing, 5H3LV from Zanzibar over the Easter week-end, Spratley Is. late March or April, VU7US and group from the Laccadives April 16-17, St. Martin FS0AB Mar 8 to 7, Albania by DL7FT last two weeks in June, and Gus AC3 planned for April.

A memo re the PA QSL Bureau. "Due to the co-operative work of the two ham associations in Holland, the QSL Bureau, Box 180, Groningen, has been closed. So all cards for all Dutch Amateurs must now be sent to Netherlands QSL Bureau, Box 400, Rotterdam, Netherlands."

HS1AET "Mercer" is now active, QSL to K6VIF, HS4AEF, usually on 20 s.s.b., says QSL to A.R.R.S., Box 22, A.P.O., San Francisco, 96237, U.S.A., whilst QSL info is not available here for HS1AEP who has been quite active on the same band.

JD1OJE, JD1ABZ and JD1AAZ were active from Bonin Is., now known as Ogasawara Is., until March 14, and for this lot the QSLs again go to the J.A.R.L.

PY0AD has been very active from Fernando de Noronha during the past weeks. He has been heard on 20 during the night and is often on 7 MHz., 7008 c.w. and 7080 s.s.b. in the last stages of that band's morning activity, about 2100z. He is also on 3503, but at 0815z which would be of little use here. His address is Box 2, Fernando de Noronha, Brazil.

TI3J and TI5CF were used by the operation from Cocos Is. earlier this year. QSL to W4VPD.

CT2AS, Madiera Is., who has been quite active on 20 MHz., stipulates that his QSLs go via the R.S.G.B., not the CT Bureau as one would expect. K3QHT sent his card to the R.S.G.B. with two IRCs and got a direct reply within two months.

HV3SJ in the Vatican was to be operated by a group of DLs from March 15 to 22, and for this period only the QSLs should go to DL1CU, Box 345, 7 Stuutgart 1, Germany.

The logs for LI2B, the Kontiki Raft, have not as yet been received by the QSL Manager LA3KG and there is no information as to when they will come to hand. The actual QSL is a beauty, and tells the story of the voyage.

A note here re the current VK0HM, who is listed as being active from Heard Island for a period of six months this year. This is not Hugh Milburn who went QRT late last year, but is in fact Giraud, formerly FB8XX on Kerguelen. QSLs for the current station go to F3MO, and for last year's operation by Hugh Milburn to W7PHO.

AWARDS

Diplome des Ameriques Francaises.—Offered by the Canadian Section of the R.E.F. It's a beauty, application to VE3AFC, B.P. 262, Quebec 4, Canada. Any band and mode., list of QSOs with 10 IRCs or a dollar to the above address. You need two stations from FP8 St. Pierre and Miquelon, two from Guadeloupe FG7, two from French Guyana FY7, and one from either Martinique FM7 or French St. Martin FS7. Contacts after Jan. 1968.

U.E.R.S. Aeterna Award.—The eternal city award, issued to any Amateur or S.w.l. who since Jan 1, 1968, has heard or made contact with Amateurs as follows. For non-European stations, 10 Rome stations. Cost is 6 IRCs, log data only to A.R.I., Sezione di Roma, "Urbe Aeterna Award," C.P. 361, Roma, Italy.

Trieste Award.—Available to Amateurs and S.w.l's, send full log details signed by a Radio Club or two Amateurs with 10 IRCs to Award Manager, I1HL, Luciano Hinze, Box 1343 34100 Trieste Italy. You need only two contacts for Plan A, or four contacts for Plan B. If so required. Plan B seal can be obtained later by forwarding log data plus an IRC. The above requirements for non-Europeans only.

(Continued on Page 35)

Overseas Magazine Review

Compiled by Syd Clark, VK3ASC and R. L. Gunther, VK7RG

"BREAK-IN"

December 1970—

Hutt Valley Branch 18 N.Z.A.R.T., ZL1BBT Historical.

Phone Monitor, ZL2AWF Untuned device consisting of 2.5 mH choke, diode, bypass and decoupling capacitors. Stated to be quite effective for phones.

Portable Transistorised Frequency Meter, ZL2NA Describes a home-made BC221, using six easily obtainable transistors and other commonly available parts. The dial mechanism was taken from a "TU" tuning unit where it was originally used on the v.f.o.

A Franklin Oscillator using FETs, ZL3APC A tried and true circuit which does not seem to be as popular as it should be. Has the advantage of using an untapped coil.

Complementary Symmetry Transistor Audio Amplifiers, ZL2TBH Does and don'ts of complementary pair design.

Modifications to Creed Teleprinters Type 7B, ZL3ALW These modifications make your Creed 7B fully automatic.

"HAM RADIO"

February 1971—

Editorial—Concerning inductance substitutes in microminiature modules.

Etched-Inductance Bandpass Filters and Filter Pre-amplifiers for 50 and 144 MHz., W6KHT. Easy to build high performance, narrow bandwidth interdigital filters and bandpass preamplifiers that feature etched-circuit inductors. Saves much space, where that is important.

Two Kilowatt Linear Amplifier for Six Mx, W6UOV. This high performance six metre linear features the new Eimac 8877 and provides acceptable stability and reliability with minimum harmonic output. The valve itself is not for Australian conditions, but the design criteria are interesting, particularly in view of the fact that the valve is rated according to Eimac's new and much more realistic "IVB" rating described last month by W6SAI.

Speech Clipping in Single Sideband Equipment, K1YZW. Audio speech clipping produces excessive distortion when used with s.s.b. equipment, as ably explained here, together with methods to avoid it. R.f. clipping gives best results, but it is important to keep p.e.p. voice peaks at least 20 dB. above background noise peaks, for psychological intelligibility!

Field Effect Transistor Transmitters, K2BLA. Low-power transmitters for two and ten metres that use field effect transistors in every stage. If you are interested in this subject, be sure also to look in Ed Noll's books (published by Sams): "FET Principles and Practice" and "Solid State QRP Projects".

Improving the Motorola P33 Series, WB2AEB. "Add these modifications and you'll have a truly high performance 2 metre rig"

De Luxe MOSFET Converters for Six and Two Metres, WB2EGZ. High performance u.h.f. converters featuring gate-protected MOSFET devices and simple construction. Very nice.

Trouble Shooting the ST-6 RTTY Demodulator, W6FFC Complete trouble shooting instructions are given along with voltage measurements and theory of operation. The ST-6 appearing in "H.R." last month appears to be the ultimate in teletype demodulator systems.

The Repair Bench, Larry Allen. "Thinking your way through repairs." Bravo!

Adding Incremental Tuning to your Receiver, VE3GFN This simple varactor-controlled circuit gives incremental tuning when added to any commercial transceiver.

Ham Notebook. Measurement of electrolytic capacitors, maintaining or adapting blowers, grid dipping transmission lines. But an important error appears in the article showing a simple method for replacing chokes or resistors by diodes in power supply filters. His theory is quite wrong, and the only benefit he obtains is by adding another electrolytic.

New Products. Microwave varactors, All About Cubical Quads (W. I. Orr), 2nd edition; Beam Antenna Handbook, 4th edition.

"SHORT WAVE MAGAZINE"

November 1970—

Using the Joystick, G3DCS. Some say it cannot possibly work. Others get DX. Here is someone who believes that it will give good results if properly tuned.

Small Battery Transmitter, G3OGR. 2 x 1T4 plus 2 x 3V4. 160/80 metre phone.

Better Sideband Reception, G3KHC. Improving standard receiver circuits.

Two Terminal Oscillator, ZL2AMJ. Two FETs and a tuned circuit.

Design of Pi Tank Circuits, G3EJF. Read this and re-design your own.

The Dual Gate Transistor for UHF Applications, The Editor Recent MOSFETs.

December 1970—

Transistor Tx for Two, G3TDZ. Straightforward QRP job.

Running the Hy-Gain 14AVQ, G3KFE. Multiband trap vertical antenna. A loaded vertical antenna about 20 ft. long which covers 40 to 10 metres. Traps are used to isolate the various sections so that it is about a quarter wavelength on all bands.

Direct Conversion Receiver for Top Band, G3YMP Using a ECC83 in a self balancing mixer circuit.

What Are Thyristors? Explanation of basic principles.

Cloth Ears, G3RJV. The psychology of c.w. reception.

Transistor Power Supply Unit, G3PKW. With overload protection. Values for two output ratings.

"73 MAGAZINE"

February 1971—

New Approach for the Metal Locator, by W6HDM A clever idea. Two l.f. oscillators produce an audio beat in a transistorised receiver, and the frequency of one of the oscillators is changed by magnetic induction from nearby metal objects.

Practical Circuit Applications using the Varactor, B. Mengel. The simple theory and practical application of voltage variable-capacitance diodes, frequency multiplication, tuning, and a.f.c.

A Clean AFSK Unit, WB4FMP. A frequency shift keyer to plug into the microphone jack of an s.s.b. transceiver. Uses two ICs.

An SSTV Patch Box, W4UMF Interconnecting various pieces of equipment for subcarrier f.m. slow-scan television.

Easy Amateur TV, K2OJL. The author considers that a basic t.v. set-up can be done simply by converting a suitable disposals device, along with a suitable camera and t.v. set. Important ancillary investments include "(1) Lots of enthusiasm, and (2) Lots of cold beer", particularly the former.

A Tuning Indicator for RTTY and FAX, by W1OER. Tuner filters plus tuning eye.

On Efficiency, Organization and Magazines, WA3BKC "Information you cannot find is useless," so the best way to use magazine articles is to tear them out and file them, taking suitable precautions to ensure subject continuity. An excellent idea, amplified in rather more detail in a similar article in "Ham Radio" of Ja. 1970 ("Use Your Magazines!").

220 MHz. for FM Pocket Receivers. A two-transistor converter to use a "police band" f.m. receiver covering 146-180 MHz.

Magnetic Deflection for SSTV, WB2ZIV. Using disposals tubes.

Build an 8-Transistor Code Oscillator with just one IC, K6MVH The HEP570.

The Beeper, K1ZJH. A QRP pulsed tone-modulated transistorised transmitter for 6 mx, useful for fox hunts, recovery devices, etc.

Study Guide: General Class Licence, Part VI., W2NSD. A remarkably clear description of basic amplifier theory, as part of the continuing series run by this magazine for licensing classes. This particular article should be read by all authors (and editors) who talk about "class B" unbiased final p.a. transistor stages.

Phone Patch Level Adjustments and Mapproofing, W4NVK. Not relevant for Australia, alas.

Perf-board Terminal, K5LLI. Making your own terminals for, and using the 0.1 spacing Vector board. An excellent substitute for printed-board construction, particularly if you want to experiment with circuit modifications.

Tuning All-Band Vertical Antennas, W5QKO/AI4QKO. The use of antenna couplers for transceiver owners who have not heard of them.

The Low-Ohm Meter, W3YZC. A clever idea, a transistor set up for constant current feeds a microammeter which is loaded by the unknown resistance, allowing very low resistances to be read.

A Cheap and Easy Gas Watcher, W6SDK. A useful solution for the considerable problem faced by transceiver owners: how to use them for receiving more than one frequency at a time. (All further comments on this kind of "progress" would be unprintable.)

— . . . —

DX NOTES

(Continued from Page 24)

QSL MANAGERS

C31BD to F9JS	FM7WQ to W4OPM
C31CV to DL3IK	FP0CA to K3OJD
CE2AT to CE3RR	FP0NQ to W2NQ
CE2AZ to CE3RR	GB3LI to G3TPV
CN8BG to W3HNK	HB0XSB to DJ8KB
CN8HD to W2GHK	HC8MJ to DJ3JR
DU1FH to W6DQE	HS1ABU to W8ZG
EL2CB to W2CTN	HS1ACW to W1HZ
ET3DS to VE3DLC	HS4ADS to WB6RYN
F0HI/FC to G3KFT	JD1ABO to JA1KSO
F0ZF/FC to DL0LA	KB6CZ to K4MQV
FH8CE to W2MZV	KJ6CD to W6TJT

That is about all the room we have for this month, my thanks to Geoff Watts DX Newssheet, I.S.W.L. staff of Monitor, the Long Is. DX Assn., VK2AHH, VK2AXQ, Ernie Luff and Maurie Batt. 73, de Don L3022.

RUSSIAN PREFIXES

The recent changeover in the U.S.S.R. from the familiar U series prefixes to the new UK series may have excited the prefix chasers, but the average Amateur remains baffled as to which country the UK station is in. The following list should help clear up the confusion.

UK1—UA1-6	UK6F—UF6
UK2A—UC2	UK6G—UG6
UK2B—UF2	UK6H, I, J—UA1-6
UK2C—UC2	UK6K—UD6
UK2F—UA1-6	UK6L—UA1-6
UK2G—UG2	UK6O—UF6
UK2I—UC2	UK6P—UA1-6
UK2L—UC2	UK6U UA1-6
UK3O—UC2	UK6V—UF6
UK3P—UF2	UK6W, X, Y—UA1-6
UK3Q—UG2	UK7—UL7
UK3R—UR2	UK8A, C, D, F—UI8
UK3S—UC2	UK8G—UI8
UK3T—UR2	UK8H—UH8
UK3W—UC2	UK8I UI8
UK3—UA1-6	UK8J—UJ8
UK4—UA1-6	UK8L—UI8
UK5 (except UK5O)—UA1-6	UK8M N—UM8
UK5O—UO5	UK8O UI8
UK6A—UA1-6	UK8R—UJ8
UK6C—UD6	UK8T, U, Z—UI8
UK6D—UD6	UK9—UA9
UK6E—UA1-6	UK0—UA0

—Peter Nesbit, VK3APN.

VHF

Sub-Editor: ERIC JAMIESON, VK5LP
Forreston, South Australia, 5233.
Closing date for copy 30th of month.
All Times in E.S.T.

AMATEUR BAND BEACONS

VK0	53.544	VK0GR, Antarctica.
VK2	144.780	VK2VE, Vermont.
VK4	144.380	VK4VV, 107m. W. of Brisbane.
VK5	52.060	VK5VF, Mt. Lofty.
	144.800	VK5VF, Mt. Lofty.
VK6	53.005	VK6VF, Tuart Hill.
	52.800	VK6TS, Carnarvon.
	144.500	VK6VE, Mt. Barker.
	145.010	VK6VF, Tuart Hill.
	435.000	VK6VF (on by arrangement).
VK7	144.900	VK7VF, Devonport.
VK9	144.600	VK9XI, Christmas Island.
ZL1	145.200	ZL1VHF, Wellington.
ZL3	145.000	ZL3VHF, Christchurch.
JA	51.200	JA1IGY, Japan.
W	50.001	WB6KAP, U.S.A.
HL	50.100	HL5WI, South Korea

Note the frequency of VK5VF has been corrected to read 145.010 MHz. Our friends in New Zealand are pressing ahead with a plan for beacons in all areas, and the latest one to appear is on 145.200 MHz. with the call sign ZL3VHF. From the V.h.f. Notes of "Break-In" come some further details of the station, viz. Power 30 watts d.c input, with antenna horizontally polarised, partially directional. Keying FSK 10 Bauds (13½ w.p.m.), call sign twice a minute, carrier off for four seconds each minute. It transmits week days 1600 to 2100 E.S.T. and continuously 1600 Friday to 2100 Sunday. These times are subject to some variation.

News comes to hand that a 6 metre beacon is being constructed for the Mt. Barker/Albany area, possibly operating on 52.500 (freq. to be confirmed). Also reports of 6 and 2 metre beacons either being considered or constructed in VK6 at Darwin, and one in VK4 at Townsville on 6 metres, using a Pye reporter. Welcome news comes from VK3 via Tim VK3ZTM that as part of the VK3WI re-building programme, units have been put aside for 6 and 2 metre beacons. Tim also reports the Sydney repeater transmits its call sign VK2BWI/R1 in m c w every five minutes as a beacon at present. Transmitting time is 23 seconds. VK3 have applied to the P.M.G. Dept. through their Divisional Council for support in gaining a licence for a 432 MHz. manned beacon, so that could be another one for the list in due course. And so the beacon list continues to grow, this is a very healthy sign and indicates an awakening interest in DX and contacts further afield than across town, at least by some of the fraternity. There is no doubt beacons are being used more and more to indicate possible good conditions for other contacts.

144 MHz. DX ACROSS AUSTRALIA

Thanks to that mighty beacon near Albany on 144.500, VK6VE giving advice of suitable conditions prevailing, contacts were once again made right across southern Australia on 18th and 20th March. Bill VK3AMK first noticed the beacon from his Ballarat QTH and telephoned Bernie VK5KJ and got him on the band, and eventually made contact late in the evening. Bill copied Bernie's s.s.m. signals up to S7, and Bill heard in Albany even better. The following morning on sked, the two stations had a rather scratchy contact. However, conditions improved again on the evening of 20th to allow Bill and Bernie again to contact. By now there were other stations in on the act. Colin VK5DK and Trevor VK5ZTR (from a very poor location shielded from the west by Mt. Gambier), Mick VK5ZDR, Eric VK-3ZKN and Bob VK3AOT. Most signal reports were towards the 5 x 9 mark, so it was certainly a good opening. The path to the west dropped out completely soon after midnight on the Saturday night. However, conditions remained good for shorter distances on the Sunday morning to allow Bill VK3AMK and Bob VK3AOT to work Tony VK5ZDY. During all this rush with Bernie, David VK5ZOO in Mt. Gambier contented himself by working into Adelaide via the Adelaide Channel 4 f.m. repeater.

Reflecting on the conditions which finally ended with the contacts with VK5KJ, it is interesting to note the comments of Bob VK-3AOT who reports as follows: "On Sunday morning (14th March) an extensive duct resulted in contacts as far south as Mt. Wellington near Hobart and as far west as Mt. Gambier. Peter VK3ZPA and VK7ZIF on Mt. Wellington at S7. The VK5 2 metre broadcast from Mt. Gambier was quite readable. On Monday night the VK6 beacon from Albany was audible in Mt. Gambier but no contacts made. Conditions on Tuesday were again very good with stations in Mt. Gambier and N.E. Victoria prominent. The band was also open again to VK5VE by reception reports of VK3ARP and others. No contacts resulted. On Wednesday morning, VK5s were strong and on Wednesday evening conditions to N.E. Victoria were particularly good." These were the sort of conditions the observant DX hound noted, and the reward being trans-continental contacts a day or two later.

Ron VK3AKC, Kevin VK7ZAH and Winston VK7KM work each other almost daily on 432. In VK3, s.s.b. activity on 432 is noted with interest. Those currently operating are Rod VK3ZQJ, Roger VK3ZRH and Tom VK3NN, the latter you DX men should note usually has a c.w. transmission on 432.336 most nights between 1900 and 2230. His beam is horizontally polarised with at least 5 dB. gain in all directions, and the QTH is 3,000 feet a.s.l. in the Blue Mountains. He would certainly welcome reports of reception. Wally VK3ZAA phoned VK5ZDX recently and amongst other things mentioned, he is getting very interested in 432 and planning to use right hand or clockwise polarisation for an antenna. As Wally lives in the Albany area, this could represent an opportunity for transcontinental 432 MHz. DX. Whether the helix type antenna will do justice to the signals unless used at both ends of the contact has yet to be proved. Anyway, someone may be able to lend Wally a beam or phased array for DX work.

On 1296 MHz., Ron VK3AKC and Kevin VK7ZAH continue their tests, with John VK7JV joining in at times. Dale VK5ZER has been conducting experiments on 1296 and now that he has passed his c.w. we hope he will continue with the experiments and not go down on the "easy bands".

A brief message has come to me from John VK3JE (ex-VK5ZJD) that interest is growing in r.t.t.y. in VK3. John carries out fairly regular tests on 144.200 with Lionel VK3ZLA and Peter VK3ZDN. I have asked John for further information on r.t.t.y. for the next issue of "A.R." In VK3 more r.t.t.y. two-way QSOs took place between George VK3ASV at Morwell and Noel VK3NR in Melbourne over a 90-mile path, using F2 on 144.344 MHz.

SIX METRES

This band has been relatively quiet during the past month. A welcome letter from Peter VK5ZDY confirms the Stop Press item of last month that he did in fact work HL5WI s.s.b. both ways on 1st March. Peter goes on to say conditions in VK5 during the past six months have been particularly good, VK1 to VK3 inclusive being worked many times and even ZLs being heard. JAs have made their appearance, and 9 or 10 were worked by three stations VK5ZDY, VK5ZCM and VK5WA on 1st March. There appears to be quite an upsurge in s.s.b. activity in the West and with the results already proven, more stations will be on that mode for next DX season.

To prove the point that you have to be around if you want to grab the DX, this little item comes to me from Wally VK5ZWW and I quote: "21/3/71, 1630 hours. Was sitting in lounge drinking (tea)". Receiver on 52.010 with extension speaker running in kitchen, where wife was sewing. She called out, "I can hear c.w." 1640: Indentified JA1ODA calling CQ and replied to him. 1642: Completed contact with him on s.s.b. Gave 5 x 5, received 5 x 5. Heard no other signal although I called and listened for another hour." As the band appeared to only open for a few minutes, someone always seems to be lucky!

Incidentally, Wally will be operational up to the early part of May on 52.010 MHz. from a location 12 miles north of Tarcoola on the trans-continental railway line, some 300 miles north-west of Adelaide. He will be using s.s.b. and running skeds with Doug VK5HK in Darwin and Kerry VK5BU in Ceduna on the West Coast for meteor scatter contacts. Adelaide has been included in his programme and Wally would welcome reports of his signal or contacts from other areas. It is unfortunate this information comes so late as the operation will probably be concluding by the time you read this.

Looking at 6 metres overall, however, April and May will be the months for trans-equatorial contacts if they are going to come. We have had the contacts made in Perth early in March, VK5ZWW grabbed one on 51st, and Bill VK-3ZWP almost made it two-way with a JA3 on 27th, indicating the signals are extending further south.

VK2 EASTERN ZONE NOTES

From George VK3ASV comes a lengthy letter with lots of news and the following are extracts therefrom. George reports that the 1970-71 6 metres Es season was the best for eight years as observed in Eastern Victoria. The first opening occurred on 3/11/70 and last on 5/2/71. George's records show Sporadic E occurring on 15 days in November, 20 days in December, 15 days in January. QSOs were made with VK1 to VK3 inclusive, and ZL4. He notes increased useage of s.s.b. The current solar cycle No. 20 has been unusual, very little like cycle 19, but somewhat similar to cycle 18 which produced excellent auroras in 1960 and 61. The auroras last year observed in the Northern Hemisphere have caused v.h.f. old-timers to speak optimistically of auroral conditions and F2 DX likely for the next 18 months.

George continues. "We have a well established 2 metre f.m. net using Channel R simplex and recently installed a repeater using channel 4 (VK3REZ) near Mt. Tassie, 18 miles south of Traralgon. We now have 41 stations using 2 metre f.m. out of 52 in the Zone. A.m. 2 metre activity is also increasing once more, this season saw eight active Amateurs and one on s.s.b. Three more will be on s.s.b. soon. The Eastern Zone V.h.f. Group has made a decision to transmit between 144.406 and 144.496, leaving the bottom section of the band clear to try and minimise the effects of overload, cross-modulation and de-sensitisation to our own locals when they are trying to work weak or DX stations. Each VK3 V.h.f. Field Day plus National Field Day at least two or three portables were in the field, no wins, but some good scores."

George has sent me pages of information regarding 144 MHz. band zoning as discussed by the Eastern Zone at various meetings. I have not had time to study it properly, but will pass on information about this in the next issue. In the meantime, it will give me an opportunity to contact George for further information.

From the pages of the Geelong Amateur Radio and T.v. Newsletter comes advice from George VK3YDB that a new Amateur Satellite is proposed to be launched in November 1971. Further details are being awaited. Also in the same publication, it is interesting to note that during the National Field Day in February the Geelong Club Station worked on v.h.f. 23 stations on 52 MHz and 60 stations on 144 MHz. Activity was certainly much greater in VK3 than it was in VK5!

The Hi-Ball experiment appears to have gone off with reasonable success, the first flight rising to about 70,000 feet, and the second to 100,000 feet, on 22rd and 25th March respectively. The expected brief report of operations through the Hi-Ball has not come to hand, it seems likely the results will be the subject of a special report to "A.R.," so the matter need not be pursued here.

The 7th Annual Radio Convention is to be held in Mt. Gambier over the Queen's Birthday week-end, 12th and 13th June. This year the programme will include for the first time as an experiment an 80 metre fox hunt, so you h.f. bods will be able to show your paces with your mobile receiver and d.f. loop. There will be plenty of things for v.h.f'ers to interest themselves if the years gone by are any guide.

HISTORY IS MADE!

In March "A.R." I referred to a "dyed-in-the-wool" c.w. operator of many years' standing turning to v.h.f. phone. For those of you who didn't guess who, the reference was to Harry VK5MY who by dint of perserverance has got himself on the v.h.f. bands and is now looked upon with pride by the Amateurs of some years' standing, and with awe by the younger fraternity! However, let's spare enough room to hear Harry's story, it surely should be an inspiration to more h.f. types to take the plunge higher up the frequency scale.

Harry's words: "It was easy to guess that Eric was referring to me in his notes in March 'A.R.' so I can't let him down by not writing something for him. I think it all started when I was helping him with c.w. practice and told him I expected him to use that mode after he got his full licence. He indicated he was prepared to learn c.w. and work both phone and c.w. on h.f. and v.h.f., but the tone of his voice clearly implied that I was too fixed in my c.w. orbit to do likewise.

"I took this as a challenge, and after diving into the junk box and brushing the cobwebs off some old gear in my garage, I came up with a 6 metre converter and an old modulator unit (p.p. 807s) acquired many years ago from W.I.A. Disposals to meet an emergency (!) such as this (PanSy rudely remarked on this in 'A.R.' at the time!), two Command transmitters and receivers and enough bits and pieces to make a power supply and a six metre transmitter. Slowly over a period of a few months, the capacitors in the modulator were replaced, the Command units were modified and a power supply and a 6 metre transmitter

were built, the latter consisted of a 12AT7 osc./doubler, 6AM6 buffer and QQE06/40 final. (Boy! Is that stretching the friendship with a 6AM6 driving a 6/40 in Class C!!—VK5LP) One Command transmitter was on 80/160 (switchable), the other on 40. The six metre converter operated into a Command receiver at a tunable i.f. of 3 MHz. Provision was also made for the modulator to plug into my trusty old 10 to 40 metre c.w. transmitter. I'm sure the 807s in that final hung their heads in shame when the mod. was applied!

"The 6 metre transmitter was first ready for testing, and I well remember the tone of disbelief of Bob VK5ZDX, when he answered my first CQ, which was c.w. (slow). Other memories—my first a.m. QSO on 40 with Les VK-5NJ wanting to know my name, thought VK5MY was a new call sign—the incredulous voice of Arn VK5XV when I called him on 20 'Is that YOU Harry?'; Pete VK5FM (working s.s.b. on 15) "What the heck are you doing up this end of the band?"; on 6 metres on the W.I.A. call-back (VK5ZDX again), 'We have a stranger in our midst!'

"Anyway, there I was after 40 years, a.m. and c.w., 6 to 160 with my trusty G5RV antenna, and believe it or not, I have recently originated the VK5WI Sunday morning broadcast on 160 with my own transmitter. My c.w. friends, VK3QL, VK5RX, etc., still speak to me, but perhaps they haven't heard this yet!

"I got a real kick out of the Dec.-Jan. DX season on 6 metres by working VK2, 3, 4, 5, 6 and 7, and I'll be there again next Dec. (with a beam I hope). I've also enjoyed many cross-band QSOs duplex 6/160 and I've been on both ends, the last such QSO was with VK5LP and who was on the 6 metre end? . . . VK5MY!

"In conclusion and just to set the record straight, I still prefer c.w., especially contests and chasing the DX on the h.f. bands. S.s.b.? Too expensive and makes working DX too easy, but I'll try it as soon as I can afford it, at least I've been told the transceivers are very good on c.w.! 73, Harry, VK5MY."

"P.S.—Look for my call sign in Ross Hull Contest results—could I ever hope to see the call sign VK5LP in the results of the c.w. section of a contest?"

All things come to those who wait Harry, so the day may appear when your final wish is fulfilled! However, your appearance on v.h.f. is treasured by all of us in VK5 and I know everyone is proud of your achievement. I wonder who will be next to try?

In concluding, I would like to thank the following for their contributions for this issue: Bob VK3AOT, George VK3ASV, Roger VK-3ZRH, Peter VK6ZDY, Colin VK5DK, Bob VK5ZDX, Wally VK5ZWW, Tim VK2ZTM, Harry VK5MY, VK6 V.h.f. Group Newsletter and Geelong Amateur and T.v. Newsletter.

Thought for the month: "Holding public office is like trying to dance in a night club. No matter what you do, you rub somebody the wrong way." That's all for this month. What about some correspondence from VK4 and VK7? Surely you haven't all closed down!

73, Eric VK5LP, The Voice in the Hills.

— . . . —

TRANSISTORISED RECEIVER

A transistorised marine communications receiver is available from R. H. Cunningham Pty. Ltd. with full coverage of the h.f. band from 1.5 MHz. to 30 MHz. in four ranges, together with a 300-350 KHz. marine band. Instant selection of the international distress and calling channel (2182 KHz.) is also provided with a built-in crystal controlled converter unit. An audio filter (6 dB. bandwidth of 180 Hz.) and tunable b.f.o. are provided for c.w. reception.

Sensitivity on the a.m. band is 15 uV. for 15 dB. signal-to-noise ratio, and for all other ranges 5 uV. for 15 dB. S/N. Thirteen transistors and seven diodes are used in the single conversion unit which has an efficient a.g.c. system, with a characteristic of less than 12 dB. change in output for 80 dB. increase in input level. The receiver can be operated from 12v. or 24v. d.c. supplies with positive or negative earthing. Zener regulation is employed.

A technical leaflet is available on request from R. H. Cunningham Pty. Ltd., 600 Collins St., Melbourne, Vic., 3000.

☆

DRAKE S.S.B. EQUIPMENT

Bail Electronic Services have been appointed agents in Australia for the well known Drake (U.S.A.) Amateur communications equipment. Enquiries for further information or requests for technical literature should be made to Bail Electronic Services, 60 Shannon St., Box Hill North, Vic., 3129. Telephone 89-2213.

Book Review

FLIGHT OF THE KIWI

By Cliff Tait, ZL1AKI

Readers may be familiar with the world flight by Cliff Tait in his Airtourer 115 light aircraft. His flight was extensively reported in "Break In". To quote from the dust cover, "Setting out as a one-man mission to publicise New Zealand to the world, he and his New Zealand-made plane ended by making history. . . . His book recounts every detail of a flight that captured the attention of the whole world".

This reviewer feels that the dust cover was written somewhat with a "tongue in cheek", as no mention of the flight was ever seen in any of the four or five Australian dailies regularly seen. Having now read the book, it is also difficult to reconcile the statement on publicity for New Zealand. Publicity for the aircraft and pilot, yes, but very little for New Zealand. It is hard to imagine the inhabitants of Greenland, Iceland or Arabia being highly excited about the outside world. Most of the stop-overs were too brief and at inconvenient times to do much about publicity, and one gathers the impression that had it not been for the necessity to refuel, the stops would never have been made.

As far as the Amateur Radio aspect is concerned, it is little more than a list of those who gave some help to the journey, so do not look for much in the radio field, as it was not a DX-pedition.

The book was designed and set in Australia, and printed in Hong Kong. It is a pity the proof-reader did not take a little more care to correct the obvious errors. Despite the fact that there are fifty or more plates in the book, there is no index for them.

Despite all the criticism, if you are looking for a couple of evenings light reading, and wish to get away from the usual run of "who done its" you can try Flight of the Kiwi. If nothing else it shows that there are still people in this world with a sense of venture.

Our copy from the publishers, Ure Smith, Sydney.

A GUIDE TO AMATEUR RADIO

Pat Hawker, G3VA, 14th Edition

The Foreword to this edition sets out the aims of the author and publishers, the Radio Society of Great Britain. The approach is quite different from that which comes from the U.S.A. and does not try to cover too much ground.

This book is designed to assist the newcomer to Amateur Radio to learn more about the hobby and to help him become a licensed transmitting Amateur. Much of the information which is necessary for novices before presenting themselves for examination is contained in this publication and it is presented in a clear and concise manner.

A Guide to Amateur Radio is an inexpensive introduction to Amateur Radio which will prove invaluable to any person desirous of entry into Amateur ranks.

Our copy from Wireless Institute of Australia, Federal Executive.—VK3ASC.

RADIO AMATEUR'S HANDBOOK

Published by American Radio Relay League

Careful attention has been given to the matter of maximum readability in this edition. The use of non-gloss paper throughout assures minimum glare. Photographs and drawings are sharp and clear, minimising the chance of incorrect interpretation of construction details.

As was true of the 47th edition, considerable revision has been made in both the theory and construction sections of the Handbook. Emphasis has again been placed on practical state-of-the-art themes. New material has been added throughout the book. The semiconductor, s.s.b., and measurements chapters have been completely rewritten to reflect modern trends and practices. The semiconductor tables have been greatly expanded to provide the latest transistor and diode specifications in simple reference form.

Numerous brand-new construction projects are included in the pages of the 1971 Handbook. Among them are such items as solid-state transceivers, receiving accessories and antennas. Solid-state receivers and transmitters have been added, plus new v.h.f. transmitting equipment.

Many additional changes have been made throughout the book to make it even more up to date than was the 47th edition. The book continues to carry the very interesting catalogue section, featuring the latest equipment, parts and services of a number of leading American companies in the electronics field.

NEW CALL SIGNS

DECEMBER 1970

VK1DZ—H. R. de Zwart, 28 Atherton St., Downer, 2602.
VK2DJ—J. Lovell, Dept. Civil Aviation Bldg., Lord Howe Is., 2898.
VK2JK—W. G. Spencer, 8 Kirkoswald Ave., Mosman, 2088.
VK2ATQ/T—R. A. Cameron, 6 Cottrell Pl., Baulkham Hills, 2153.
VK2BHJ—H. J. Town, Block C7, 2-14 Goulding Rd., Ryde, 2112.
VK2BJE—J. Bijou, 34 Atchison St., St. Leonards, 2065.
VK2BTW—E. D. Weaver, Brolgan Rd., Parkes, 2870.
VK2ZDE—M. G. Kane, 4/34 St. Andrew St., Maitland, 2320.
VK2ZEG—P. F. Babik, 115 Felton Rd., Carlingford, 2118.
VK2ZGC—A. W. Reynolds, 1/30 Alexandra St., Drummoyne, 2047.
VK2ZRL—R. A. Mackeller, 1 Johnson Ave., West Ryde, 2114.
VK3VE—Wireless Institute of Australia (Victorian Division), Station: Rooks Rd., Vermont: Postal: 478 Victoria Pde., East Melbourne, 3002.
VK3ABC—F. D. Voight, 113 Pattern St., Sale, 3850.
VK3ABQ—J. A. Moran (Sgt.), "Frognall," 54 Mont Albert Rd., Canterbury, 3126.
VK3BES—Swinburne Electronics Society, Swinburne College of Technology, John St., Hawthorn, 3122.
VK3BEV—J. M. Lipson, 3 Montague St., Highton, 3216.
VK3BEX—M. A. V. Rivenell, 9 Maryborough Rd., Boronia, 3155.
VK3BTS—Blackburn Technical School Radio Club, Koonung Rd., Blackburn, 3130.
VK3YDK—W. J. Fanning, 8 Welwyn Pde., Deer Park, 3023.
VK3YEP—R. D. Gillett, 2 Lade Crt., Ringwood, 3134.
VK3YER—G. N. Robinson, 573 Pascoe Vale Rd., Oak Park, 3046.
VK3YET—P. M. Stewart, 35 Holding St., Beaumaris, 3193.
VK3YEU—M. J. Farrell, 10 Spring St., Belmont, 3216.
VK3YEV—I. R. May, 35 Pollock Ave., Traralgon, 3844.
VK3YEY—S. D. C. Tovey, 10 Clare St., Mordialloc, 3195.
VK3YFA—K. L. Feltham, 161 Wallace St., Bairnsdale, 3875.
VK3YFB—D. J. Atkinson, 53 Woolcock St., Warracknabeal, 3393.
VK3ZOU—J. C. Spence, 585 Drummond St., North Carlton, 3054.
VK4EK—N. S. Maddern, 7 Dajarra St., The Gap, 4101.
VK4ZEM—P. Mead, 71 Coverdale St., Indooroopilly, 4068.
VK4ZJH—B. J. G. Johnston, 10 Dalrymple St., East Mackay, 4740.
VK4ZJN—R. J. D. Hay, 6 Hack St., Ziilmere, 4034.
VK5DZ—M. J. Groth, 75 Charles St., Prospect, 5082.
VK5JR—G. D. Smythe, 3 Betula Rd., Mt. Gambier, 5290.
VK5ZPC—P. Clemence, 8 Robins St., Elizabeth Downs, 5113.
VK5ZRI/T—R. N. Soutchcott, Yatala Vale Rd., Yatala Vale, 5126.
VK5ZRK—R. L. Spurrier, 167 Shepards Hill Rd., Eden Hills, 5050.
VK5ZTH—T. R. Hutchesson, 45 Swallow Dr., Mt. Gambier, 5290.
VK6QC—F. N. Schwartz, 9 Norman St., Gosnells, 6110.
VK6SC—J. A. Scanlon, 119 Davis St., Boulder, 6432.
VK6TP—R. A. Taylor, 23 Gordon Rd., Morley, 6062.
VK6ZV—F. X. Lawlor, 8/123 Watkins St., Hilton, 6163.
VK6ZDS—I. A. Sorensen, 15 Redwood Cres., Melville, 6156.
VK7MT—R. M. Trott, 186 Punch Bowl Rd., Launceston, 7250.
VK7TB—T. R. Briggs, 18 Melbourne St., Launceston, 7250.
VK8CH—C. A. Hermiston, 5 Hingston St., Parap, 5790.
VK8EG—E. A. Gribl, Jnr., Station: Mobile; Postal: P.O. Box 4171, Darwin, 5794.
VK9MX—K. W. Gooley, Mawson.
VK0ZPO—C. L. Scally, Mawson.

CANCELLATIONS

VK1BB—S. E. Boller. Not renewed.
VK1ZKQ—D. W. F. King (Cpl.). Not renewed.
VK2AE—L. E. Harris. Deceased.
VK2HS—E. M. Fanker. Deceased.
VK2IO—R. E. Durrant. Transferred to Vic.
VK2JR—J. G. Reed. Deceased.
VK2KJ/T—K. L. Finney. Transferred to Vic.
VK2RC—J. M. Campbell. Deceased.
VK2TR—R. A. Taylor. Transferred to Vic.
VK2AGT—J. K. Langley. Deceased.
VK2ALI—P. G. Dale. Not renewed.
VK2BLR—Lakemba Amateur Radio Club. Not renewed.
VK2ZFH—A. C. Counsell. Now VK2CI.
VK2ZGP—G. E. Millward. Transferred to Qld.
VK2ZGT—D. K. W. Bradbury. Now VK2ASY.
VK2ZJG—J. D. Holt. Now VK2BBZ.
VK2ZJW—J. G. Winter. Not renewed.
VK2ZKD—L. J. McHugh. Not renewed.
VK2ZMP—M. F. Potts. Now VK2BMH.
VK2ZQR—R. C. Quick. Transferred to A.C.T.
VK2ZRY—R. W. Young (Dr.). Transferred to Qld.
VK2ZVP—R. H. Little. Now VK2BVP.
VK2ZWM—W. S. Munn. Now VK2BMX.
VK3CX—A. G. Brown. Deceased.
VK3AOR—R. W. McLean. Not renewed.
VK3YAH—Swinburne Electronics Society. Now VK3BES.
VK3ZUC—R. W. Walker. Transferred to W.A.
VK4DM—R. J. S. Davis. Not renewed.
VK4HE—H. Clayton. Not renewed.
VK4ZHH—A. J. Murphy. Not renewed.
VK5DL—T. P. Drake. Not renewed.
VK5QJ—J. C. Hulse. Transferred to W.A.
VK5VE—W. N. Thomas. Not renewed.
VK5ZBO—B. J. Brice. Not renewed.
VK5ZGR—G. D. Smythe. Now VK5JR.
VK6ER—E. A. Ray. Left country.
VK6HJ—H. M. Smith. Left country.
VK6CIE—F. W. Fletcher. Transferred Interstate.
VK6ZAT—R. A. Taylor. Now VK6TP.
VK6ZFU—L. Janes. Transferred to Vic.
VK7RN/T—R. D. C. Nicholls. Deceased.
VK7ZLX—T. R. Briggs. Now VK7TB.
VK9DZ—M. J. Groth. Now VK5DZ.
VK9RI—R. M. Inwood. Not renewed.
VK9ZKN—D. K. Morgan. Transferred to Vic.

— . . . —

COOK BI-CENTENARY AWARD

The following additional stations have qualified for the Award:

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
1265	K6TYT	1284	W6UZC	1303	SM4BDX
1266	W3AXW	1285	ON4NA	1304	W4BRB
1267	JH1NVZ	1286	AX3FS	1305	ZM2AFT
1268	KR6LY	1287	W9GHO	1306	UA3HO
1269	DJ3YW	1288	EP2FB	1307	UA4PW
1270	HB9J	1289	AX3BF	1308	UW4NH
1271	KH6HJV	1290	JA6BRV	1309	UK5MAF
1272	AX2AKV	1291	W4JK	1310	UK2BBB
1273	JH1OGX	1292	AX5RR	1311	RA3ACQ
1274	AX3BCD	1293	G4JW	1312	UC2BF
1275	CT1UE	1294	OK1AGQ	1313	UA3HB
1276	HB9AOU	1295	SM7DRQ	1314	UA0ML
1277	AX2BMK	1296	W6DLN	1315	UA6NH
1278	W6ABA	1297	KH6DA	1316	UT5WW
1279	KG6APP	1298	KL7MF	1317	RA0LEH
1280	JA1AAT	1299	XE1LLS	1318	UA0IK
1281	XE1AE	1300	G3EBH	1319	UY5XS
1282	I1JZ	1301	AX2BJL	1320	UK3VAA
1283	YT2REY	1302	LU5AH	1321	UA3HI

V.H.F./U.H.F. SECTION

22	AX3ZCT	24	AX5ZNH	25	AX4ZIM
23	AX2ZLN			26	AX3ZYO

SILENT KEY

It is with deep regret that we record the passing of—

VK2MW—M. C. Darby.
VK3ADZ—G. E. Delahoy.

HAMADS

Minimum $1 for forty words. Extra words, 3 cents each.

HAMADS WILL NOT BE PUBLISHED UNLESS ACCOMPANIED BY REMITTANCE.

Advertisements under this heading will be accepted only from Amateurs and S.W.L's. The Publishers reserve the right to reject any advertising which, in their opinion, is of a commercial nature. Copy must be received at **P.O. 36, East Melbourne, Vic., 3002,** by **5th of the month and remittance must accompany the advertisement.**

FOR SALE: A Yaesu FTDX400 Transceiver complete with built-in power supply for 240v., SP400 matching speaker, cords, connectors, circuit and handbook. The unit is 18 months old, been used conservatively and is in excellent condition both electrically and mechanically. The lot is going for $470 or nearest offer. Please contact Phill Bowers, VK2YS on Wagga Wagga 4343 (STD 0693) during working hours or at P.O. Box 551, Wagga, N.S.W., 2650.

FOR SALE: Complete 50w. xmitter, Geloso 5-band v.f.o., 807s in final, fully metered, grid modulated, in 6 ft. rack and cabinet, P.M.G. type. $50 or best offer. Will separate if necessary. VK3YF, L. Johnson, Phone 81-2754.

FOR SALE: Hallicrafters SR160 three-band Transceiver, 150w. p.e.p., in very clean condition, new p.a. tubes fitted, handbook, $250 o.n.o. VK1JL, 28 Atherton St., Downer, A.C.T., 2602. Phone Canberra 49-7830.

FOR SALE: Latest Lafayette HA800 solid state rx with crystal calibrator, six bands incl. 80, 40, 20, 15, 10 and 6 metres. Cost $210, sell $145. Morris, Phone (Melb.) 467-2131 all hours.

FOR SALE: Panda PR120 tx, 150w., five bands, ph./c.w., complete, a.c. powered, $175. Also R.C.A. AR88D rx, 540 KHz. to 32 MHz., six bands, $175. Ansafone Mk. 2, Tele answer/record machine, $200. Send s.a.e./e. for list of other gear. Must sell going o/seas. VK1YD, P.O. Box 237, Canberra City, 2601. Phone 95-6554.

FOR SALE: Quantity of Ham Radio gear, late VK4UL: AM Transmitter, HRO Receiver (valves), Frequency Meter. Phone 48-3084 after 6 p.m. week days. 51 Real St., Annerley, Qld., 4103.

FOR SALE: Tektronix dual-beam C.R.O. Type 561B. With plug-in 3A8 and 3B3. Calibrated, delayed sweep. 500ns/div. to 1s/div. time base. Dual-trace amplifier d.c. to 10 MHz. within 3 dB. First appeared in 1969. New price $2,000. Phone (Melb.) 347-2674 (evenings) or 340-5451 (work). John Spence. $800 or offer.

FOR SALE: Telescopic Tower, tiltable, three-section, 75 feet, in good order. Phone 47-3820 (Melb.).

WANTED: Collins 51J1, 51J2 or 51J3 receiver. Also Johnson Valiant or Ranger transmitter (Mk. I. or II.). Clean units preferred. Buy or borrow brief loan "73" June 1965. VK3IB, Box 35, Dimboola, Vic., 3414.

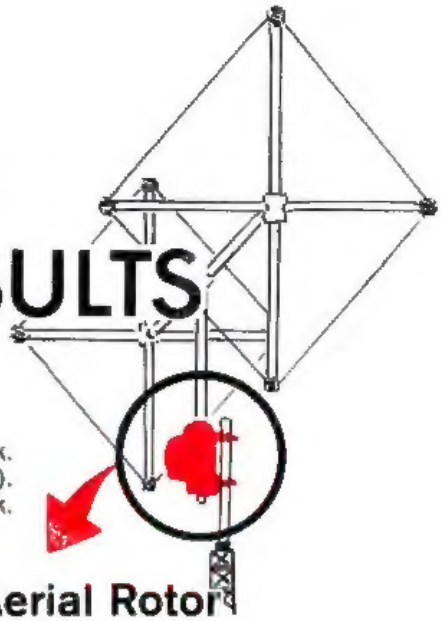
WANTED: R.C.A. Fleetfone 30-50 MHz. Mobile Receiver. Also Knight 152-174 MHz. V.h.f. Receiver. I. Delves, C/o. 49 Medina Road, Glen Waverley, Vic., 3150. Phone 232-9616.

WANTED TO BUY: S.s.b. 5-band Transceiver, Swan 500, 350, FTDX100-400, TR3-TR4, SR150, NCX5, TS510 or similar. Also Linear HA14, SB200, FL2000, etc. Details to J. Forster, VK3CDX, 8 Bristow Drive, Forest Hill, Vic. Phone 877-1135.

WANTED TO BUY: Type "A" Mk. III. Trans/Receiver. Phone Jules, VK7ZD, Hobart 25-2905 (home), or 34-4587 (business hours).

WANTED TO VIEW: A working Fremodyne as published in Electronics Australia, May 1970 (to find out where I went wrong!). Alternatively, to purchase a working copy without audio and power supply sections. Harley Price, 637 Burke Road, Camberwell, Vic. Phone 82-2108 (Melb.).

3 WAYS to get BETTER CONTEST RESULTS



① ROTATE Your Antenna AUTOMATICALLY —

Beam "spot-on" with ease and efficiency . . . no more guess work.
• A low priced **Antenna Rotor** for lightweight beams (55 lbs. max.).
• Simple to install. • Fingertip control right there in your shack.

stolle automatic -Aerial Rotor

②

EC10 Mk.II

CONTACTS Come In LOUD & CLEAR

On an **EDDYSTONE** Communications Receiver. There is a model to suit your requirements — right through to the VHF/UHF bands. Log those hard-to-get contacts with an **EDDYSTONE, DOW-KEY, STOLLE** combination.

EDDYSTONE Communications Receivers

③ ANTENNA Switching . . .

SEND - RECEIVE . . . SEND - RECEIVE. Quick and efficient antenna switching ensures rapid "send - receive" operation. A boon when contest fevers are running high. Use **DOW-KEY** High Performance Relays for complete dependability.

DowKey CO-AX RELAYS

These are the **HEADPHONES you can wear ALL DAY** — Sennheiser Model HD 414. • Very lightweight. • They let your ears breathe — you can hear the phone ring or the XYL calling. • You do not have that "shut in" feeling. • Removable sponge ear pads.

SENNHEISER HD 414 Stereo Headphones

★ ★

For prices and full particulars of the items listed here please write to:—

Australian Representatives:

R.H. Cunningham PTY. LTD.

VIC.	608 COLLINS STREET, MELBOURNE, 3000. PHONE: 61 2464.
N.S.W.	64 ALFRED ST., MILSONS POINT, 2061. PHONE: 929 8066.
QLD.	L.E. BOUGHEN & CO., 30 GRIMES STREET, AUCHENFLOWER, 4066. PHONE: 70 8097.
W.A.	34 WOLYA WAY, BALGA, 6061. PHONE: 49 4919.

TELEX, MELB. 31447: SYDNEY 21707